

Color Managed Workflow: Working Space

Perhaps one of the most misunderstood Photoshop concepts is that of working space. The selection of a working space has a significant impact on the quality of edits and ultimately on the quality of the output, whether it is to web or print.

Just as color devices can have device profiles, images can be profiled with image profiles. Photoshop translates the color of individual pixels in all RGB, CMYK, and Grayscale mode files using image profiles, known as working spaces, prior to sending that image to a monitor or other output device. To put it a bit more technically, Photoshop's color management engine uses a working space to convert the information in the image into the reference color space. From there, it can again be converted by the color management engine into the color space of any profiled device such as a monitor or printer. This working space can be either the one you set as your preferred space in Photoshop's Color Settings dialog, or one already embedded in your image file.

From version 5 on, Photoshop has had the ability to embed a working space profile in a Photoshop file. These are known as tagged files. Embedded working spaces insure that a Photoshop file looks the same even when viewed on different monitors (assuming a calibrated and profiled monitor). This allows the shared editing of files across two or more systems or users. Adobe Illustrator from version 9 on and Adobe InDesign version 2 can also embed working spaces and work with tagged files.

Version 6 of Photoshop supports document specific color which allows you to open a file with an embedded working space different from your preferred working space selected in Color Settings, and view that document correctly with its embedded working space. This is a welcome change from version 5 which forced you to match the embedded working space with the preferred working space for a correct preview.

The rest of this tutorial will discuss working spaces in terms of RGB images, but the same general concepts apply to working spaces in CMYK and Grayscale. Only the working spaces themselves are different.

Selecting Your Working Space

In Photoshop 6, you set a preferred RGB working space in the Color Settings dialog box (Edit/Color Settings...) by selecting one of the offered color spaces from the drop down menu beside RGB Working Spaces. This working space then becomes the default working space through which you view all new files created in Photoshop and all existing untagged files that you open in Photoshop.

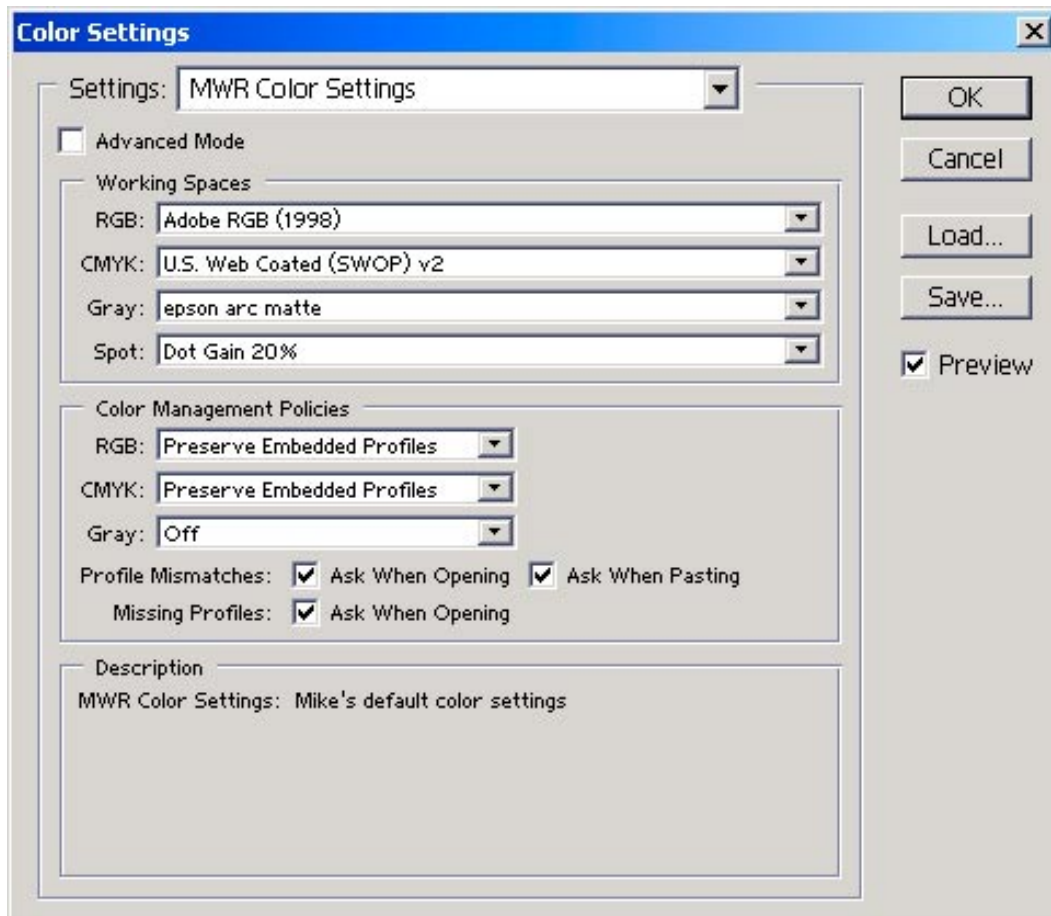


Figure 1: Color Settings dialog box.

There is no off button for working space. Photoshop has to have some way to translate the image into the reference color space before converting the information for your monitor. If the image does not have an embedded working space, then Photoshop uses the working space selected in Color Settings. If you open an image in Photoshop with an embedded working space different than your selected working space, then you can choose which working space to use in viewing the image. Photoshop always translates your image using some working space.

Which Working Space Should I Use?

Your choice of working space will determine the colors that are available as you edit, and ultimately output, your image. A working space's range of colors is its gamut. Your goal is to match your working space gamut to the gamut of your output device.

You can let Photoshop make the working space decision for you by selecting one of the predefined color management settings from the Settings drop down shown in Figure 2. For many users, these predefined sets will work just fine.

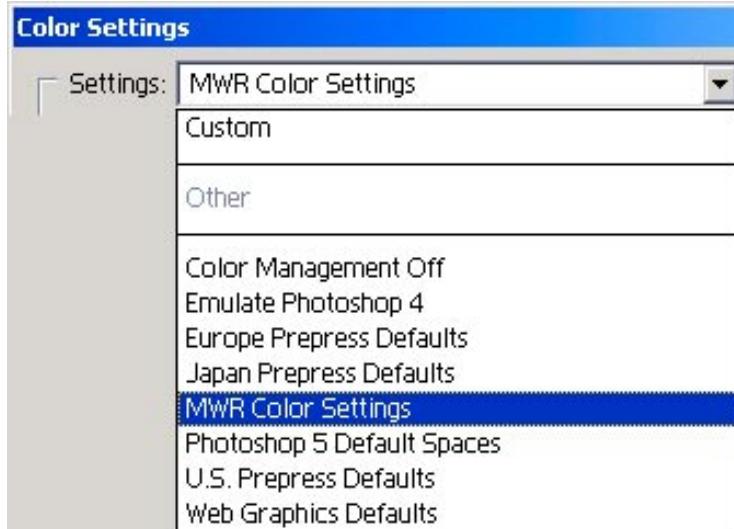


Figure 2: Settings drop-down with predefined settings showing.

Don't be fooled by the "Color Management Off" selection under Settings. This particular set of predefined color management settings sets the RGB workspace to your default monitor profile, generally not a good choice for most users. More about these predefined settings below.

Alternately, you can make your own combination of Color Settings by selecting Custom from the Settings drop down and saving your selections with the Save... button. These custom settings files can be shared by multiple users and by other Adobe programs like Illustrator and InDesign.

Most of the predefined settings will select either Adobe RGB(1998) or sRGB IEC61966-21 for your RGB working space. Macintosh users have a predefined setting choice, ColorSync Workflow, that accesses the preferences made in the ColorSync dialog and the Monitors Control Panel, and keeps you from having to repeat your selections in the Color Settings dialog.

The standard RGB choices for a PC are shown in Figure 3.

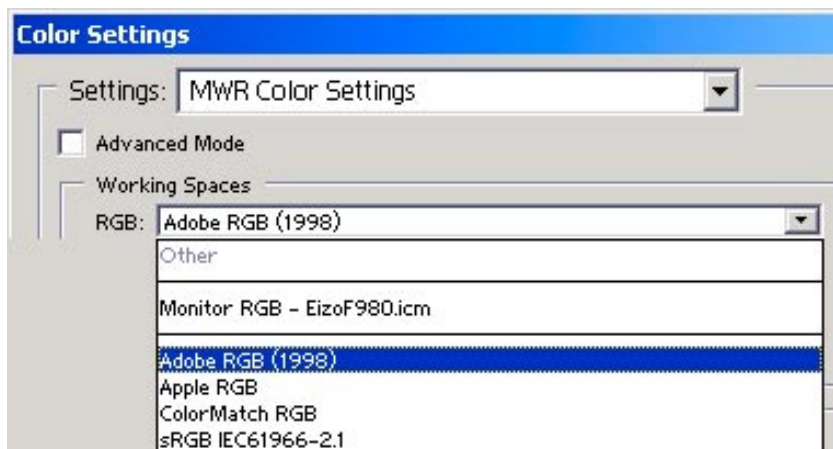


Figure 3: RGB Working Spaces drop-down selection list.

Most users will end up in either Adobe RGB or sRGB. In general terms, Adobe RGB has a larger gamut than sRGB, and allows you to work in more saturated color (not more colors) than sRGB. Adobe RGB more closely matches the color gamut of photo quality color printers. It is a good choice for those users working in RGB with output going to print, either as RGB files for photo quality inkjet printers, or, after conversion, as CMYK files for offset printers. sRGB, with its smaller color gamut, is intended to match the characteristics of the average PC monitor. It is a good choice for images going to the web and for images going to color printers with limited color capabilities.

Other Adobe supplied working spaces include Apple RGB, which reflects the characteristics of the average Macintosh monitor, and ColorMatch RGB, which matches the color space of the Radius Pressview monitor. ColorMatch RGB has a smaller gamut than Adobe RGB, but has been long used as a standard for prepress work in the publishing industry.

All of these Adobe supplied working spaces map the characteristics of various output devices with limited gamut ranges, either printers or monitors. Embedding one of these profiles in an image with a wide gamut, say a raw scan from a scanner capable of capturing a wide gamut from color film, will force the wider gamut into the smaller gamut space by clipping or converting pixel data. This implies that you should save copies of any wide gamut images before allowing Photoshop to embed a working space and losing the wider gamut information from the file.

Incidentally, one important characteristic of all these RGB working spaces is their ability to form a neutral gray with equal values of red, green, and blue. This becomes an important feature when color correcting images.

You also have the option of either importing other RGB working spaces or creating your own custom working spaces. Import RGB spaces by selecting Load RGB... under the RGB drop down menu in the Color Settings dialog and then selecting an icc/icm file. Create a new RGB workspace by selecting Custom RGB... and entering the requested data in the Custom RGB dialog.

Color Management Policies

Once you select a preferred working space, you control how Photoshop deals with working space issues under the Color Management Policies section of Color Settings. You have three choices:

- Off,
- Preserve Embedded Profiles, and
- Convert to Working RGB.

The policy options for RGB are shown in Figure 4.



Figure 4: Color Management Policies section of Color Settings dialog.

Remember, turning off color management policies does not stop Photoshop from using your selected working space to render the file for viewing. What it does do is stop Photoshop from embedding a profile in a new document created in Photoshop, embedding a profile in an untagged document opened in Photoshop, or stripping a profile from a tagged document that has a different working space than the one selected in Color Settings.

If you choose to have color management policies on (and you generally should), then you have the choice of having a default policy of preserving embedded profiles (Preserve Embedded Profiles) or converting conflicting profiles to your selected working profile (Convert to Working RGB). No matter which policy you choose, you should check all of the options that require Photoshop ask you about how to handle missing or mismatched profiles. If you do not have these options checked, then Photoshop can change your file without notification. If the profile conflict resolutions are checked on, then you will always be given the opportunity to choose how Photoshop handles the conflict, potentially avoiding a nasty surprise.

Changing Working Space

Once you have a Photoshop image file, with or without an embedded profile, you can control embedded working spaces through the Assign Profile and Convert to Profile commands found on the Image/Mode menu.

You use the Assign Profile dialog, shown below in Figure 5, to remove an embedded color profile from a tagged image, assign a profile to an untagged image, or reassign a new profile to a previously tagged image.

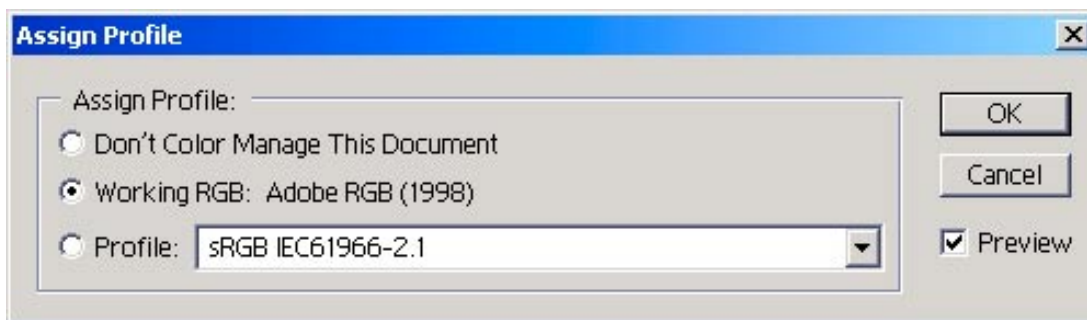


Figure 5: Assign Profile dialog box.

You use the Convert to Profile dialog, shown in Figure 6 below, to convert a tagged or untagged document to a new profile. The Source Space is the current working space (which is Photoshop's working space for an untagged file), and the Destination Space is the working space you want the document converted to. You will almost always want to use the Adobe color management engine to do the conversion. Intent allows you to select the rendering intent that you wish to use for the conversion, which briefly is the method used to translate the file to the gamut of the destination working space.

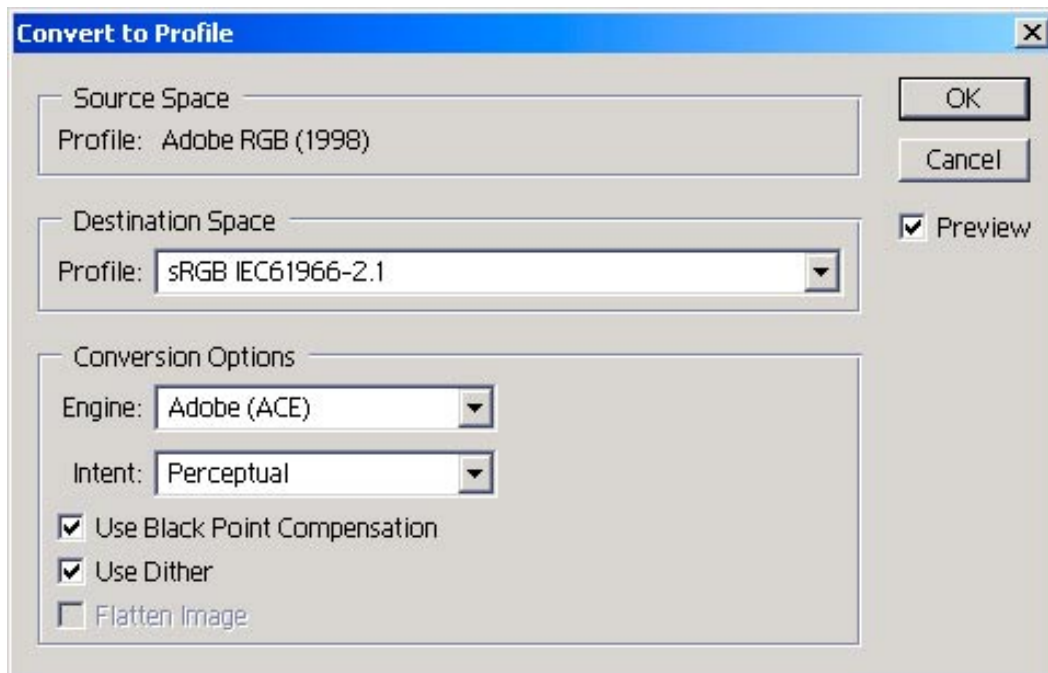


Figure 6: Convert to Profile dialog box.

The difference between Assign and Convert lies in how they treat the image file. The Assign Profile command does not change the pixel values of the image when a new profile is assigned; therefore, the image can look quite different after assigning a new working space. The Convert to Profile command does change the pixel values of the image in an attempt to preserve the appearance of the image when assigning a new profile.

Finally, using the Save As command on the File menu allows the removal of the embedded profile by unchecking the ICC profile option when saving a new copy of the image file.

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