

**Today's Question:** I've been experiencing "out-of-gamut" colors which show up in my prints. How does Photoshop CS5 determine colors which are out of gamut? Does the printer profile, monitor profile, or printer drivers have an affect? Note that my printer is an Epson 2200.

Additionally, in Photoshop "Color Settings / Conversion Options", I've set "Intent" to Perceptual - should I be using "Relative Colormetric"?

I'm running both Photoshop CS5 in 32-bit and 64-bit; I'm experiencing "out-of-gamut" colors with both, but less so with 32-bit Photoshop. Lastly, I'm running Windows 7; is that an issue because I never experienced this "out-of-gamut" problem with Windows XP Professional.

**Tim's Answer:** I suppose first I should clarify that out of gamut colors actually won't appear in your prints, which is the real problem. So I assume what you're saying is that colors aren't appearing accurately in your prints, and this is a common issue that can obviously be frustrating.

Out of gamut colors are, quite simply, colors your printer, ink, and paper combination isn't able to produce. In general, that means the highly saturated colors in your images, and generally you'll find that a given printer has a difficult time with particular colors. For example, in my experience the Epson 2200 has a difficult time producing highly saturated red colors.

The specific range of colors a specific printer is capable of producing obviously relates primarily to the specific inks being used by that printer. However, the choice of paper will also affect the potential color gamut. For example, uncoated matte papers tend to absorb the inks quite significantly, which can reduce the degree of saturation present in the prints. That means you can often achieve better results in terms of color gamut (particularly saturation) by using coated papers or even glossy papers.

The rendering intent you've set in Color Settings only affects the conversion from one color space or profile to another, so I suspect that isn't an issue in your particular workflow, since we're talking about printing here. However, the rendering intent is certainly an issue in terms of printing those colors. You just need to set it in a different place. Specifically, in the Print dialog when you specify the printer profile (which should be set based on the specific printer, ink, and paper combination you're using, with the "Photoshop Manages Colors" option selected).

I do find that in most cases the Relative Colorimetric rendering intent produces better results compared to the Perceptual rendering intent, but it is worth trying both to get a sense of what works best for your particular output conditions and the types of photos you print. The Relative Colorimetric rendering intent will cause in-gamut colors to be left alone, and will cause out-of-gamut colors to be shifted to the closest matching in-gamut color. Perceptual, by contrast, causes all colors to be shifted so that the relationship between colors remains the same, but the actual color values are shifted so that all

colors are in-gamut. What that translates into is that with Perceptual the overall saturation of all colors tends to be reduced, especially if there are significant out-of-gamut colors. So, I recommend Relative Colorimetric, but that doesn't mean it is always the right answer.

Photoshop determines which colors are out of gamut based on the printer profile you're using to print. That profile defines the range of colors the printer can print for the paper and ink combination you're using with the printer. The RGB values in the image identify the actual colors present, so by comparing the two, Photoshop can determine whether a given color is one that the printer can reproduce. All of the colors that are present in the image but not within the range defined by the printer profile are out of gamut.

Of course, just because there are out-of-gamut colors doesn't mean the image won't print. As mentioned above, the rendering intent determines how the out-of-gamut colors are dealt with, with colors the printer isn't able to produce replaced by colors the printer is able to produce. So the final print will appear as a full-color photo, it just might have some colors substituted. In most cases that won't cause a glaring problem in your print, but rather a print where some of the colors don't look as vibrant as they should, or look to be less than accurate relative to your original image.

You can view which colors are out of gamut for a particular printer setup using soft proofing. Simply choose View > Proof Setup > Custom from the menu, and set the Device to Simulate option to your printer profile (for the paper and ink combination you'll be using). Adjust the other settings based on your print settings, and click OK. Then choose View > Gamut Warning from the menu (the Proof Colors option will have been turned on automatically by setting the Proof Setup option). This will display (by default) a gray overlay on the image in areas where the colors can't be printed based on the profile you specified.

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