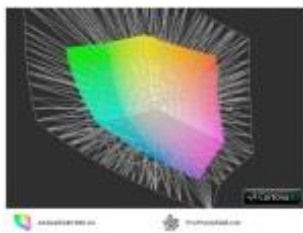


Digital Printing Insights #6: Color Space Conversions and Gamut Loss

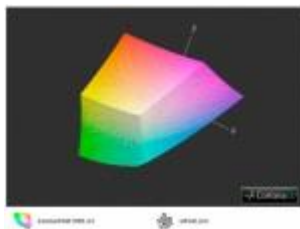
© 2009 Michael E. Gordon

"I need to convert an image from AdobeRGB to CMYK, but I'm concerned about color shifts and need to retain 100% of the Adobe RGB gamut (gamut = the entire range of color that can be reproduced within this color space). Is this possible?"



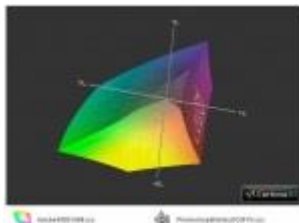
AdobeRGB vs. ProPhotoRGB

Unfortunately, it is not possible. Any time we convert from a wide gamut color space such as Adobe RGB or ProPhoto RGB to a *smaller* color space (such as any of the CMYK color spaces), we diminish the color gamut. Take a look at the graphic at left, which compares the Adobe RGB color space with the ProPhoto RGB color space. Here we can see that Adobe RGB (the solid color space) is considerably smaller in gamut compared to the massive ProPhoto RGB space (represented by the wire frame). Before I proceed any further, let me clarify something which you might already be thinking: "so, I can convert from Adobe RGB to ProPhoto to gain a wider color gamut?" No! We can only convert downward, from a larger color space to a smaller color space. Converting upward will not expand the gamut any further, as it has already been limited by the origin color space (compare this to pixel resolution, whereby interpolating [or "uprezzing"] does not gain us additional data beyond what was already provided by the sensor).



Adobe RGB vs. sRGB

Let's take a look at another comparison (at left), this time Adobe RGB to sRGB, the color space we all view on our monitors. Many of us edit our images in Adobe RGB, but then convert to sRGB for web display. As you can see in this comparison, Adobe RGB (represented by the solid color) is a larger color space than sRGB (represented by the wire frame). You've probably already intuited this, but what this means is that when we convert to sRGB for web display, we *shrink* the color and tonal palette of the image. You most certainly have been aware of this, and have probably wondered why your web JPEG's don't look a fraction as good as your original wide-gamut file.



Adobe RGB vs. CMYK

Now that you're starting to get the hang of this, let's look at one last conversion/comparison, this time from Adobe RGB to Photoshop 5's Default CMYK space. In this conversion, we can see that except for a very small amount of magenta/orange, the Adobe RGB color space is much larger than the CMYK color space. Again, this means that when we make the conversion, the entire color gamut BUT that magenta/orange area (represented by the wire frame) is diminished greatly.

Clear as mud? The take-away idea here is that one should always work with the widest available color space. For digital camera users this means RAW, not sRGB or JPEG, and for those who scan film, this means scanning it into the Adobe RGB or ProPhoto RGB color spaces. When we're forced to convert to smaller color spaces for print or web display, we have to accept the losses.

If you have any questions or comments about this topic, or suggestions for future Printing Insights, I would love to hear them! Thanks for reading.