

Colour spaces - summary

(Barry Pearson, 06 October 2011; version 1).

Photoshop (and other products) have a number of colour modes. There are specialist modes such as CMYK and Lab. Those are not discussed here. This article is about RGB mode: representing colour using coordinates for Red, Green, and Blue.

RGB basics

Consider just of 8-bit working to keep things simple. Each channel (Red, Green, Blue) can have a value from 0 to 255. 0 means minimum light, 255 means maximum light. If the value are the same as one-another, it is a neutral tone (grey). "0 0 0" means black. "255 255 255" means white.

But ... what is the value for a London RouteMaster bus in given lighting conditions? It depends! Look at the small white circle on the side of the bus behind the driver:



RGB: 229 1 52: (If the image is saved as JPEG & **sRGB**)

RGB: 196 1 57: (If the image is saved as JPEG & **Adobe RGB**)

RGB: 160 60 47: (If the image is saved as JPEG & **ProPhoto RGB**)

If images with these values are saved as JPEG, *and the displaying products "thinks" the images are in sRGB*, (a typical default), then the following are the colours they will display. Using Adobe RGB or ProPhotoRGB and not converting to sRGB before saving as JPEG may result in duller displays, *if the display products are not colour managed*:

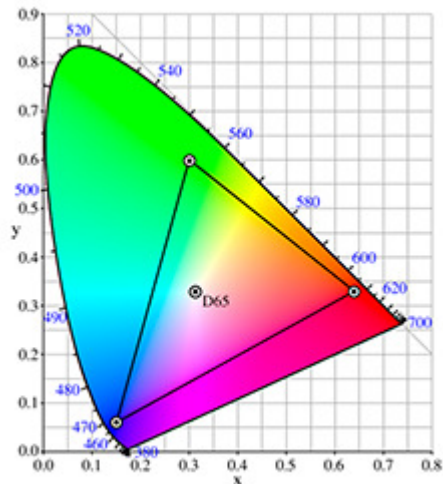
229 1 52

196 1 57

160 60 47

Most used RGB colour spaces

sRGB

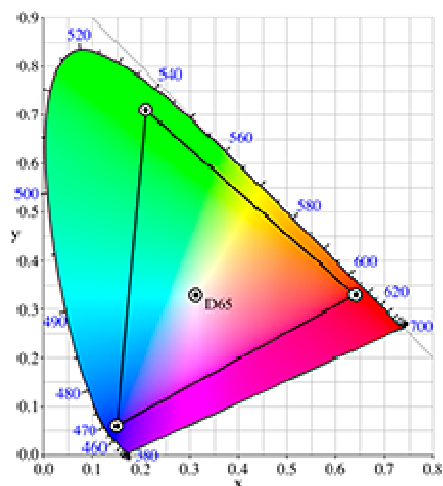


The coloured area in each diagram represents the colours typically seen by the eye. This is the same in each diagram on this page.

The triangle in each of these diagrams is the "gamut" of that colour space. Only colours within the triangle can be accurately represented; the rest are "out of gamut". The points of the triangle are the colours represented by that particular channel: obviously, the upper-most point is the Green channel, the bottom-left is the Blue channel, and the middle-right is the Red channel.

sRGB can't represent all the visible colours, and was designed to match colours of older display monitors (and hence the web). It is suitable for 8-bit working, because the numbers don't have to cover a lot of colour-variations compared with larger gamuts.

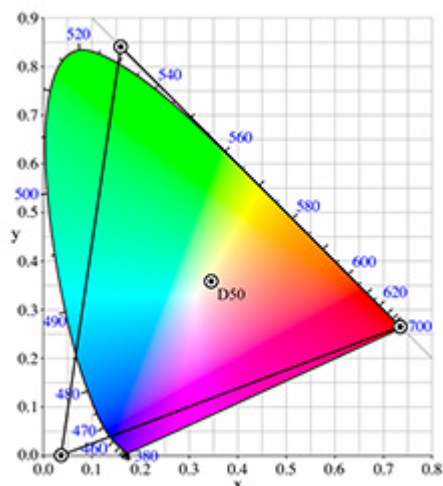
Adobe RGB



Adobe RGB has a bigger gamut because the Green channel represents a different colour from the sRGB Green channel. This means that not only are certain Greens better represented, but also some colours that are mixtures of Green and either Red or Blue, such as some Cyans and Yellows. On the whole, the differences are not massive. (But **I** work in Adobe RGB to take advantages of the differences that **do** exist. And I print from Adobe RGB).

Because it is a larger gamut, some people say that Adobe RGB needs 16-bit working so that the greater range of colour-variations can be handled, especially if a lot of tonal range adjustments are made using Levels and Curves. I do my major tonal range adjustments in Lightroom, (which is probably working with about 15-bits), and normally have no problem working in 8-bit mode in Photoshop.

ProPhoto RGB



ProPhoto RGB has by far the biggest gamut of these three colour spaces. All the channels have greatly different colours even compared with Adobe RGB. Not only can some Reds, some Greens, and some Blues, be more accurately represented, but many combinations of any two of these are better too.

As far as I know, it is generally accepted that using ProPhoto RGB requires 16-bit working. That can be a disadvantage, because this needs more processing, results in larger files, and there are probably still some filters that won't work in 16-bit mode.

The "Pro" in the name gives a clue that many (not all!) professionals use this colour space. I don't, but I sometimes wonder what I'm missing.

Suggestions

If you are not comfortable with colour management

Make sure *everything*, (cameras and applications), says sRGB, and use sRGB end-to-end.

(If you shoot JPEG, the camera should use sRGB automatically. If you shoot raw, it may have a choice of colour space, which won't affect the sensor data but may influence applications downstream. Set sRGB to be sure).

Try to ensure that every time a file is saved, it has an embedded (sRGB) profile.

If you are comfortable with colour management

Where possible use products that support colour management - including any major Adobe product.

Explicitly control all colour space settings (see below) in all hardware and software products - leave nothing to chance.

Try to ensure that every time a file is saved, it has an embedded correct profile.

Ensure that all JPEGs are in sRGB (by conversion or "save for web") with an embedded sRGB profile.

Some settings

Camera: probably in Raw menu

Photoshop: Edit > Color Settings... > Working Spaces

Adobe Camera Raw: click on the link under the image

Lightroom: Edit > Preferences > External Editing