Colour Management & Profiling

Why

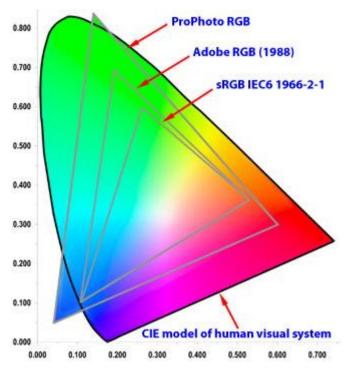
Colour management in photography is very important if we are to produce a final product (digital projected image or print) which matches what we saw when took the photography or what we created on the computer during post processing. We can spend many hours and waste paper, ink and money if we do not get this set up correctly through the workflow. We have all looked at the final print and been disappointed at how it looks – the skin colour is wrong, it looks drab and flat, colours are shown different to what we wanted.

There are three stages to colour management in our workflow – In camera, post processing, and display (screen, print or DPI), and we need to understand how each of these can affect the image and how to set them correctly. In this worksheet, I will look at each stage in the process. But before we do, let's have a look at what we mean by colour profile or colour space.

Colour Space

A colour space defines a range of reproducible colours. sRGB describes the range of colours that can be shown on a standard computer monitor or projector whereas Adobe RGB images deliver better colour rendition than sRGB when printed, but do not look as good on a monitor as an sRGB image.

The diagram below represents the two main colour spaces used in photography (Adobe RGB and sRGB) overlaid onto the colour space the average human eye can typically see. Adobe RGB covers



about 50% of what the eye can see, whereas sRGB covers only 35%. In other words, Adobe RBG has a wider Gamut.

Adobe RGB can display greater levels of colour particularly in the green and cyan range compared to sRGB.

If we start off with an image in Adobe RGB and then convert to sRGB we will throw away some of the green and cyan colours, however if we start off with sRGB and then convert to Adobe RGB we do not gain any colours. Therefore it is advisable to use Adobe RGB from the image capture through post processing, and only finally converting to sRGB (or paper profile – more about this later) right at the end.

The third colour space shown on the above diagram is ProPhoto RGB, which has an even greater Gamut than Adobe RGB, and should be used within post processing, being available in both Lightroom and Photoshop.

A quick comparison between Adobe RGB and sRGB:

Adobe RGB	sRGB
Pros	Pros
Wider range of colours (Gamut)	Displays correctly for web
More vibrant and accurate colours for prints	Suitable for digital image projection
Can be converted to sRGB	Well matched to typical PC monitor
Cons	Cons
Will not display correctly for web without	Cannot be converted to Adobe RGB
conversion	Narrower range of colours.
Will not display correctly as a digital projected	
image	

In Camera

This is where it can become a little confusing. Most cameras, when shooting in RAW have a native colour space which is neither Adobe RGD nor sRGB, but is determined by the sensor and processor and is greater than Adobe RGB. It is when the image is exported from the camera that colour space is decided.

I shall work on the basis that we are working in 14 bit RAW extracting the most colour information available from our camera to start the workflow.

Most cameras have an option in the menus to set the colour profile sometimes called colour space.

Nikon

For example, Nikon have the option in the shooting menu: (note some Nikon cameras may show different menu options).



Canon



Select [Color space].

- Under the [
 ¹] tab, select [Color space], then press <
 ¹>.
- Set the desired color space.
 Select [sRGB] or [Adobe RGB], then
- press < ()>.

File Naming

File naming in the camera is used to differentiate whether the image is in Adobe RGB or sRGB colour space, for example:

- a) Adobe RGB images are named as _DSC1000.NEF (.TIF or .JPG)
- b) sRGB images are named as DSC_1000.NEF (.TIF or .JPG)

This is a standard convention and is common to most camera manufacturers, including Canon, although using a .CR2 suffix.

Recommendation

The recommended option here is to set the colour space in the camera to Adobe RGB, as this gives the most options and potentially a better image as starting point for post-production or editing.

Post Processing

Having set up our cameras to use the correct colour space, we now need to look at how we edit the image. Here we have four options available:

- a) Lightroom
- b) Photoshop (via camera RAW)
- c) Camera manufacturers proprietary software
- d) Other image processing software e.g Paintshop Pro, GIMP DXO etc. and including standalone RAW processing.

At the moment, I shall concentrate on just the first two options, but will look more closely at the proprietary software from Nikon and Canon in the future.

Lightroom

There are no options available in Lightroom to set the colour space for images, as Lightroom is preset to use either Adobe RGB or ProPhoto RGB as explained below.

Lightroom primarily uses the Adobe RGB color space to display colors. The Adobe RGB gamut includes most of the colors that digital cameras can capture as well as some printable colors (cyans and blues, in particular) that can't be defined using the smaller, web-friendly sRGB color space.

Lightroom uses Adobe RGB:

- for previews in the Library, Map, Book, Slideshow, Print, and Web modules
- when printing in Draft mode, we will come back to printing in a later section
- in exported PDF slideshows and uploaded web galleries

Export One File		×
Export To:	Hard Drive ~	
Lightroom Presets Vser Presets	Quaity)	^
Export for PDI	▼ File Settings	
Export for web full size jpeg	Image Format: JPEG V Quality:	68
gary and rebecca tiff export	Color Space: sRGB	κ
	AdobeRGB (1998) Timage Sizing ProPhoto RGB	_
	Resize to Fit: Other	
	1600 pixels V Resolution: 300 pixels	per inch 🗸
	▼ Output Sharpening	
	Strangen For: Screen V Amount: Standard	~
	▼ Metadata	
Add Remove	Include: Copyright Only ~	~
Plug-in Manager	Expo	rt Cancel

In the Develop module, by default Lightroom displays previews using the ProPhoto RGB color space. ProPhoto RGB contains all of the colors that digital cameras can capture, making it an excellent choice for editing images. In the Develop module, you can also use the Soft Proofing panel to preview how color looks under various color-managed printing conditions.

When exporting images into an external editing program, for example Photoshop, we can set the default colour profile to use from:

General Presets	External Editing	File Handling	Interface	Performance	Lightroom mobile	Network	
Edit in Adobe Photo	shop CC 2015						
File Format	: TIFF		16-bit ProPhot color details fro		mmended choice for b	est preserving	
Color Space	ProPhoto RGB	\sim					
Bit Depth	: 16 bits/compor	nent ∨					
Resolution	: 300						
Compression	None	\sim					

Edit / preferences / external editing tab

It is here where we need to set the colour space to ProPhoto RGB, as this will give consistency when editing in Photoshop. The options shown for File Format, Bit Depth and Resolution should also be used for best results.

One further aspect of the Lightroom develop module I want to look at here is Soft-Proofing of images. This will show on screen how the image will appear when printed, and allow you to fine

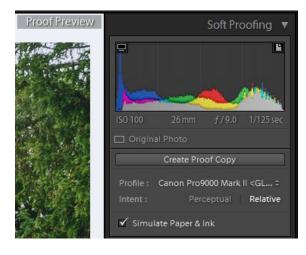
tune your image. This will also show a warning for any part of the image which is outside of the Gamut –

- Colours outside of the printers capabilities will appear red in the image preview area
- Colours outside of the display's color capabilities appear blue in the image preview area
- Colors that are outside the gamut of both the monitor and destination device appear pink in the image preview area.

To enter Soft Proofing mode, tick the box in the status bar at the bottom of the Develop Module.



Three things will happen – The border around the image will turn white; the text "*Proof Preview*" will appear in the top right of the image window; and the soft proofing panel will appear.



This is where we can try out different profiles for example:



Photoshop

Before starting to work with Photoshop we do need to set it up so that it works as we need, and the defaults are set correctly.

Firstly, we need to set the working colour space, which is found under

Edit / color settings

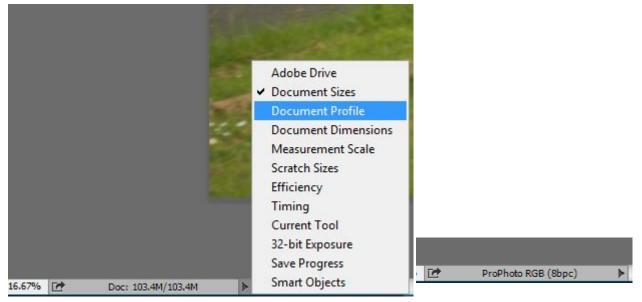
This then opens up a panel with a number of options available:

Color Settings		×
Settings: Custom \$ Working Spaces RGB: ProPhoto RGB \$ CMYK: U.S. Web Coated (SWOP) v2 \$ Gray: Dot Gain 20% \$ Spot: Dot Gain 20% \$	Conversion Options Engine: Adobe (ACE) Intent: Relative Colorimetric Use Black Point Compensation Use Dither (8-bit/channel images) Compensate for Scene-referred Profiles	OK Cancel Load Save
Color Management Policies RGB: Preserve Embedded Profiles ‡ CMYK: Preserve Embedded Profiles ‡ Gray: Preserve Embedded Profiles ‡ Profile Mismatches: Ask When Opening Ask When Pasting Missing Profiles: Ask When Opening Description	Advanced Controls Desaturate Monitor Colors By: 20 % Blend RGB Colors Using Gamma: 1.00 Blend Text Colors Using Gamma: 1.45 For more information on color settings, search for "setting up color management" in Help. This term is searchable from any Creative Cloud application.	

Now, working through the settings: (I have shown the most important settings in red, all others can be left as default)

Working Spaces	RGB	Set to ProPhoto RGB for consistency with Lightroom
	CMKY/Gray/Spot	Leave as set
Colour Management	RGB	We have three options here:
Policies		Off: do not use
		Preserve Embedded Profiles
		Convert to Working RGB
		We have a choice here, if we preserve embedded
		profile, then no matter what the profile is of the
		image we are importing Photoshop will not change it;
		If we select convert to working RGB, and we have set
		this to ProPhoto RGB, then Photoshop will convert the
		image to the Working RGB.
		I would suggest we set this to convert to working RGB,
		then when the image is imported it will be changed to
		ProPhoto RGB (chose Ok to open file), and we will
		have consistency with Lightroom.
	CMKY/Gray	Preserve Embedded Profiles
Conversion Options	Engine	Leave as Adobe (ACE)
	Intent	Out of the four options, Relative Colormetric is the
		recommended choice
Advanced Controls		Leave as default

If you are unsure as the colour space of the image you are working on, a very quick way to check is to look at the bottom of the screen, where you will see a small arrow, click on this and select Document Profile:



When importing an image via Camera Raw, the image will open with the colour profile set in the Camera, but will then convert to the working RGB, as it opens into Photoshop.

Display (Print and Projection)

Having worked on our image, we have a final product which we are happy with, but we now need to make sure that when it is viewed, the image colours, brightness, contrast etc., are as we have seen them on screen.

This is where display and print profiles become important. There is no point in spending time creating a wonderful image on our computer screen if the screen does not show colours properly, i.e. it is out of configuration. No matter what we do in this situation, we will never get the printed image or even projected image to look right, we will just waste money and not show our work at its best.

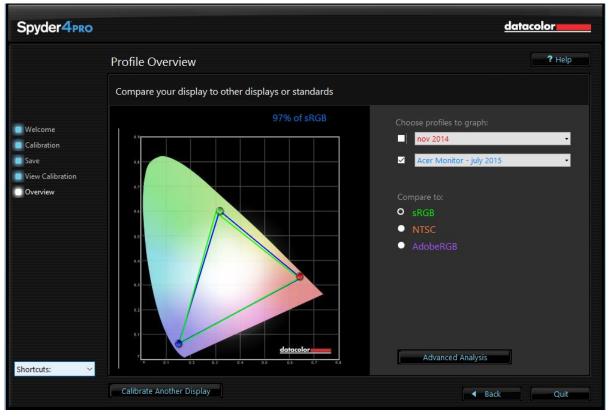
Now LCD screens are much better than the old CRT displays, but they do need to be profiled, when first set up, and then once a month or so.

Display screen profiling is carried out using a specialist device such as:

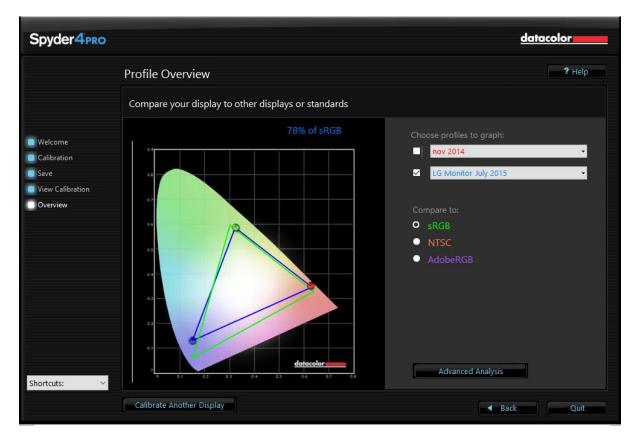
- Datacolor Spyder (Express, Pro or Elite)
- Xrite ColorMunki (Smile, Display, Photo)

Both tools are easy to use, and the software guides you through the process. The Datacolor Spyder produces a graph for each screen profiled comparing the screen to sRGB and Adobe RGB. For

example, my main monitor is a very close approximation to sRGB (and 74% of Adobe RGB).



But my second monitor is much worse than this (and it has been profiled as best as it can be) – it does need replacing.



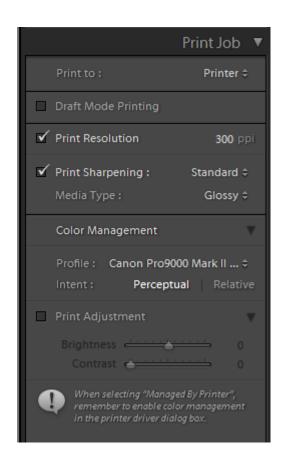
Which just goes to show that not all monitors are equal!

Print

Now we come to finish our workflow with a accurate print of our image, this can be achieved in either Lightroom or Photoshop.

Lightroom

We need to go into the Print Module, and assuming we have already set up the print size, paper size and orientation etc., we then need to look at the Print Job section of the right hand panel.



Either to a printer or jpeg file

Leave unticked

300 ppi is normal resolution for most printers

Deselect if sharpening done in develop module This depends on paper type

Choose profile for your printer, ink and paper Perceptual if many out of Gamut colours Relative if few out of Gamut colours

Print adjustment Brightness and contrast give a final optional adjustment

The Perceptual or Relative intent options can be problematic, as it is difficult to choose which one is most applicable. As a starting point, I would suggest Perceptual intent only because most printers may have a smaller Gamut that Adobe RGB and as a result many out of Gamut colours, but it is one of those options to try both and select the one which looks best.

Photoshop

Choosing printer profiles is carried out differently in Photoshop. We need to convert the image to the profile that we want to use, by using

Edit / Convert to Profile

This opens up the following where we can select the correct profile for our printer, paper type and ink type.

Convert to Pr	ofile	>	×
- Source S	Shace		
	ProPhoto RGB	ОК	
Prome:	PTOPTIOLO KGB	Cancel	1
— Destinat	ion Space		
		Preview	
Profile:			
	Acer Monitor - july 2015 Acer Monitor 16 may		^
- Conversi	Acer Monitor apr 03		
Engine:	Acer Monitor apr 09		
	Acer Monitor apr 26-04		
Intent:	Acer Monitor aug 2015 Acer Monitor feb2015		
🗹 Use Bl	Acer Monitor july 2014		
	Acer Monitor march 30th		
Use Dr	Acer Monitor oct 2014		
📃 🗌 Flatten	Canon IJ Color Printer Profile 2005 Canon Pro9000 Mark II <fa> 1/3 Fine Art Paper Photo R</fa>	200	
	Canon Pro9000 Mark II <fb> 1/3 Fine Art Museum Etchi</fb>		
	Canon Pro9000 Mark II <fc> 1 Other Fine Art Paper</fc>	-	
	Canon Pro9000 Mark II <gl><pp> 1 Photo Paper Plus G</pp></gl>		
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	Canon Pro9000 Mark II <gln><ppn> 3 Photo Paper Plu</ppn></gln>		
	Canon Pro9000 Mark II <lu> 1 Photo Paper Pro Luster</lu>		
	Canon Pro9000 Mark II <lu> 3 Photo Paper Pro Luster</lu>		
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1000	CIE RGB		
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and the second	EPSON sRGB EPSON Standard RGB - Gamma 1.8		
and the	Fuji DP2 ProAm.icm		
15-53-8-33	HDTV (Rec. 709)		
	LG Monitor		¥

We have a couple of further options to consider

Convert to Profile	\times
Source Space Profile: ProPhoto RGB Destination Space Profile: Working CMYK - U.S. Web Coated (SWOP) v2 +	OK Cancel V Preview
Conversion Options Engine: Adobe (ACE) + Intent: Relative Colorimetric + Use Black Point Compensation Use Dither Hatten Image to Preserve Appearance	Advanced

Engine – keep as default

Intent – as for Lightroom above.

Black point – preserves shadow detail

Display (DPI)

This is where we can produce our image in a format for projection.

Lightroom

In Lightroom, we need to export the image from the Library module. Here we right click on the selected image, or select the image and click export at the bottom left of the screen. Assuming that we have selected a folder to export to, renamed as required, we come to file settings:

Export One File		×
Export To	Export One File	
Lightroom Presets		^
 User Presets Export for PDI 	Image Format: JPEG V Quality:	
Export for web full size jpeg	Color Space: sRGB V Limit File Size To: 100 K	
gary and rebecca		
tiff export	▼ Image Sizing	
	Resize to Fit: Width & Height Onn't Enlarge	
	W: 1024 H: 768 pixels V Resolution: 300 pixels per inch V	
	▼ Output Sharpening	
	Sharpen For: Screen	
	▼ Metadata	
	Include: Copyright Only	
Add Remove	Remove Person Info	
Add Remove	100-04 Versional and Schlassen (Barrada).	<u>~</u>
Plug-in Manager	Export Cancel	

Here we set the colour space to sRGB, file type to jpeg, quality to 100 and we can set the width & height to 1024 x 768.

With the image size, do not worry if the image is not in these proportions, Lightroom will automatically set either the height or width to a maximum of 1024 or 768.

Leave sharpen unticked.

Photoshop

Photoshop is a little more complicated in that we have a two or three stage process, but many more options in how we wish to display our image.

Again, assuming we have completed our image, and it is ready to be set up for digital projection.

Firstly in older versions of Photoshop, we need to convert the image to 8 bit (Photoshop CC does this automatically as part of the process).

To convert to 8 bit –

image / mode / 8 bits per channel

Then we need to convert the image to the correct profile for projecting – sRGB.

Edit / convert to profile

Convert to Profile	×
Source Space Profile: ProPhoto RGB Destination Space Profile: sRGB IEC61966-2.1 \$	OK Cancel Preview
Conversion Options Engine: Adobe (ACE) Intent: Relative Colorimetric Use Black Point Compensation Use Dither Flatten Image to Preserve Appearance	Advanced

And choose the correct profile – all other options as previously mentioned.

Finally, we need to convert the image to the correct size:

Image Size				×
	Image Size: Dimensions:		px × 4912 px	۵.
	Fit To:	Original S	Size	\$
	Width:	7360	Pixels	\$
	🔀 🛏 Height:	4912	Pixels	\$
	Resolution:	300	Pixels/Inch	\$
	Resample:	Bicubic S	harper (reduction)	\$
	ОК		Cancel	

Image / image size

Change width and height to 1024 x 768. (you only need to change one dimension, the other will change automatically). Resample should be set to "Bicubic Sharper (reduction) for best results.