

Color Management 101

The 3 Steps to Successful Color Management



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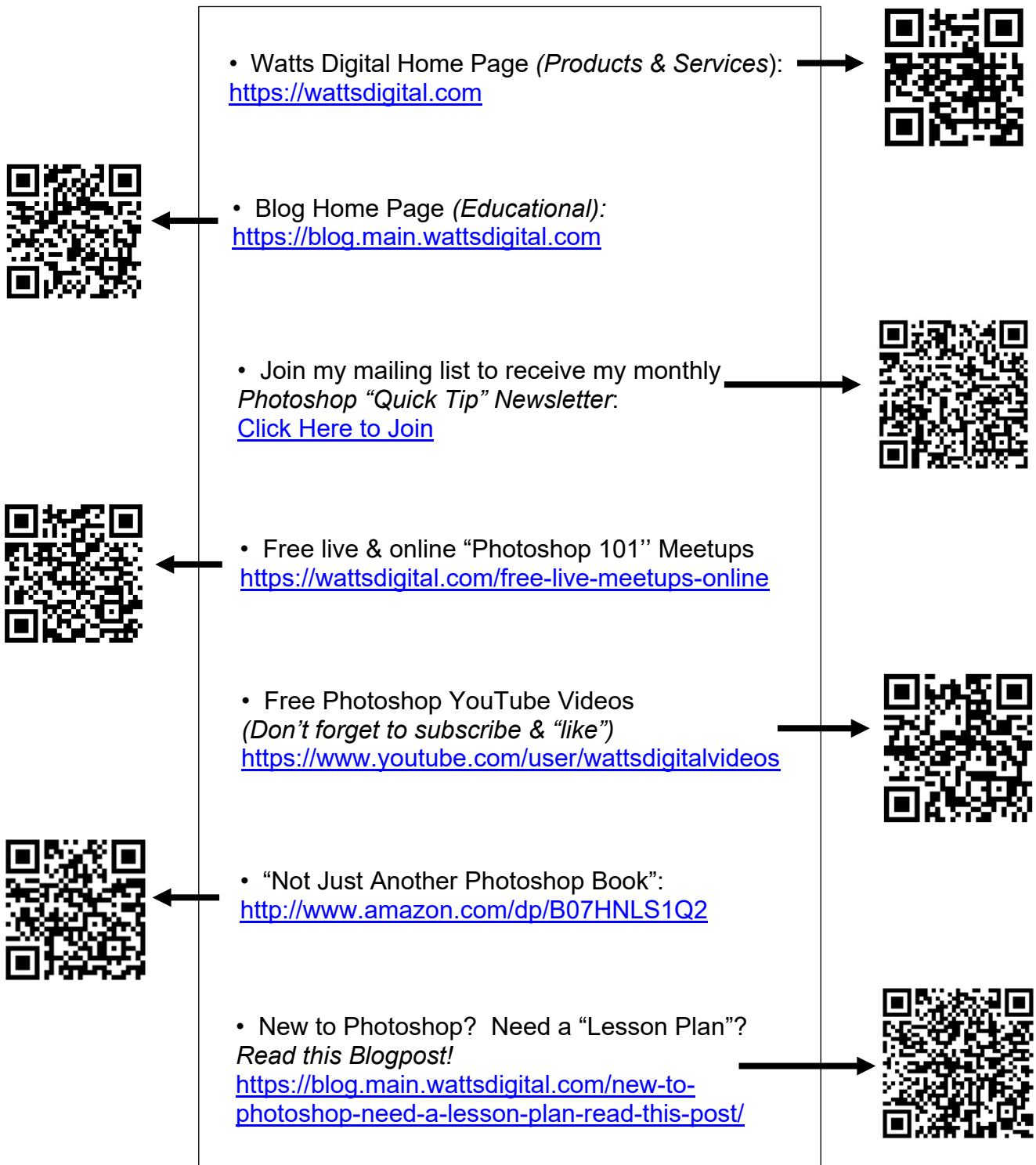
John M. Watts, Jr.

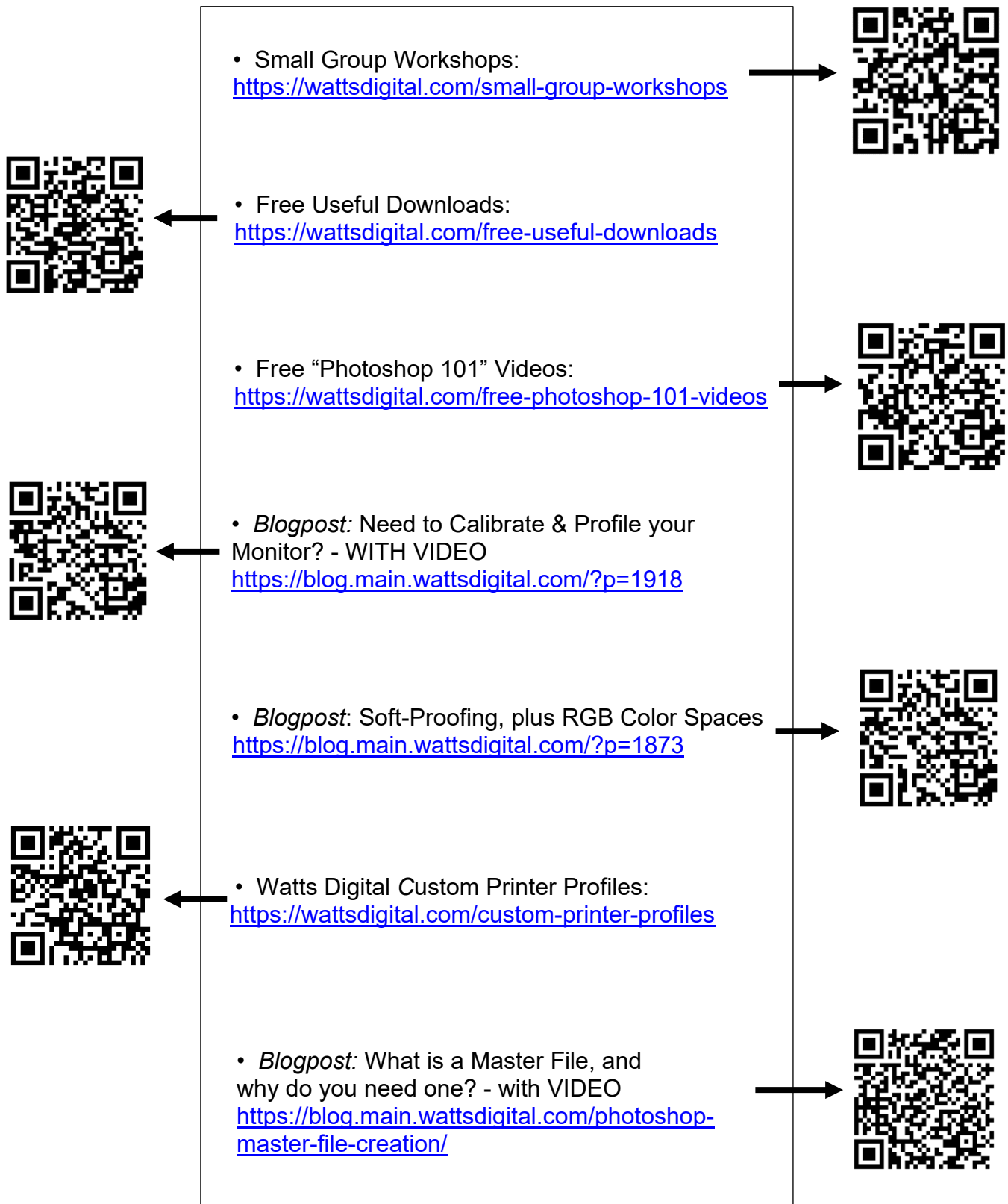
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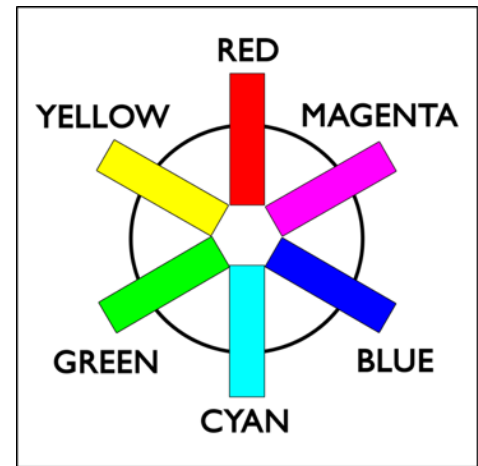


The Three Steps to Successful Color Management

What is it, and why do you need it?

One of the critical elements in successfully bringing an image from camera to its printed form is **Color Management**.

- Proper **Color Management** will allow you to print with a great degree of consistency and repeatability, whether it's on your home inkjet photo printer or through a custom print lab.
- It allows you to print what you see on your monitor with a large degree of accuracy. The old adage, "**WYSIWYG**" (*What You See Is What You Get*) readily applies when you're properly color-managed.
- To accomplish a properly color-managed workflow, you'll be creating and/or using one or two *Profiles*: **one for your monitor** and at least **one if you have a home photo printer**. A "**Profile**", by the way, is nothing more than a small file which tells your computer how to act and what to do – *you never even open it!*



There are Three Steps to Successful Color Management:

Step 1 – Calibrate your Monitor and Create a Monitor Profile (Page 2)

Step 2 – Use the Proper Printer Profile or Create a Custom Printer Profile (Page 4)

Step 3 – Assure that you have Proper Lighting Conditions and Perception (Page 6)

- **Step 4 (OPTIONAL) – Soft-Proof Your Image** (Page 7)

*I realize that this subject can get confusing, but just remember, that anytime you have a challenge with proper color management, **it comes back to one of the three steps listed above not being “quite right”** - so, if you've got questions, call or email - I can help.*

■ Step 1 - Calibrate your Monitor and Create a Monitor Profile

IMPORTANT COLOR MANAGEMENT “RULE”:

*To take advantage of all that your printer has to offer,
you’re matching your MONITOR to your best PRINTER output,
NOT the other way around!*

Profiling your Monitor is “Step #1”. But let’s face it: the main reasons most people avoid profiling their monitor are because they’ve got to buy something (which is true), and/or they think it’s too complicated (which is not true).

The truth is, it can be quite simple to get your monitor to closely match the output of your photo printer OR favorite custom print lab. All you need are the right tools, the main one being a **Monitor Profiling package**, which consists of a piece of hardware called a colorimeter, and the software to go with it.

You’ll never get your monitor to be a 100% accurate representation of your print, due to the different physical light properties between your monitor (emitted light) and your print (reflective light). *but it will be extremely close, resulting in savings in time, money and frustration!*

The best way to calibrate and profile your monitor is to invest in a **Monitor Profiling Device** such as the **X-Rite Eye-One Display Pro** (NOT the “Studio” model!) or the **Datacolor Spyder X** (\$225 to \$250).

- **What is it?** It’s a piece of hardware called a colorimeter (It looks like a pregnant computer mouse), and the software to go with it. *I’d strongly suggest purchasing one – it’ll make life easier!*
- See this post on my blog for more on this, **WITH VIDEO** (QR Code to the right):
<https://blog.main.wattsdigital.com/?p=1918>



If purchasing a Monitor Profiler isn’t an option right now, you can use the “by-eye” calibrators built in to your computers’ operating system. This is far from a perfect solution, and *I’d use it as a “last resort”* – it’s very subjective, but better than nothing.

- For **Windows**, use the **Adobe Gamma Utility** (usually in “Control Panel”). For **Mac**, use the **Mac Calibration** (“Apple” menu -> “System Preferences...” -> “Displays” -> “Color” -> “Calibrate...”).



By the way, I keep saying “**Calibrate**” and “**Profile**” your Monitor. It really is two steps. First, you **Calibrate** your monitor to a given standard, then you create a **Profile** so that your monitor will keep showing that Calibration.

How the Monitor Profiler Works: *This procedure will vary between the various manufacturers, but basically this is how it works:*

- 1) Install the software and plug the colorimeter into your computer via the USB port.
 - 2) Attach the colorimeter to your monitor (usually, it just “hangs” off the top edge of your monitor).
 - 3) Start the software, use the “advanced mode”, and run through the step-by-step procedures.
 - 4) Save the generated profile.
- Most of the better software packages (including the two profiling packages mentioned) allow you to choose an “easy” mode and an “advanced” mode – - **for best results, choose the “advanced” mode.**

Using the “Advanced Mode” in your software will allow you to choose a specific
Color Temperature, Gamma, and Lumens.

- **Color Temperature** is measured in degrees Kelvin (°K). A smaller Kelvin value is warmer (yellow cast) than a larger Kelvin value, which is cooler (blue cast).
- **Gamma** is a function of contrast and midtones.
- **Lumens** (CD/m²) are a measurement of brightness: A lower Lumens value is darker than a higher Lumens value.

In the “Advanced Mode” of your software I would suggest setting a calibration “starting point” of: 5500°K (Kelvin), 2.2 Gamma, and 110 Lumens (CD/M2).

- I say “starting point” because each system is a bit different, and you will see trends in your printing. *Of the three steps to successful Color Management, you may need to “zero in” your optimal values for your particular system.*
- **Here’s the procedure for “zero-ing” in your optimal monitor settings:** you may need to “zero-in” your optimal monitor settings and recalibrate – *but generally I’ve found that the above values are correct 90+% of the time.*
 - A) If, after calibrating and profiling your monitor, you see a trend of your prints coming out *consistently* dark over time, then you’ll need to recalibrate with a lower lumens value - say, 100 lumens.
 - B) Or, if your prints tend to be *consistently* warmer (reddish-yellowish) overall over time, change the color temperature to 5000°K. Conversely if they are *consistently cooler* (blue-ish, cyan-ish), change it to 6000°K, and recalibrate. **A note of caution:** *Before you make these adjustments, all other aspects of your Color Management must be in order.*
- **How Often to Profile:** Monitors tend to “drift”, color-wise. You’ll need to re-calibrate and re-profile on a regular basis – - approximately every 3 to 4 months, even longer with newer monitors.
- **Internal Monitor Controls:** Unless you have a newer monitor or an Apple product, you’ll need to locate and learn how to use the OSD (On Screen Dialog) controls and the “User RGB” controls.
- Unless it’s an Apple product, **Laptop Monitors** are notoriously hard to calibrate and profile, and the color may “drift” quickly - -you may need to re-calibrate & profile every few weeks.

■ Step 2 - Use the Proper Printer Profile or Create a Custom Printer Profile

A **Printer Profile** makes the most out of your printer's capabilities by characterizing the behavior of your printer/ink/paper combination. With a Printer Profile, in combination with the other elements of Color Management, you will significantly improve the accuracy and quality of your print output.

- You will need one Printer Profile for each paper/ink/printer/resolution combination that you print on.
- Unlike a Monitor Profile, a Printer Profile will not “drift” appreciably unless you change printers, ink type / brands, paper type / brands, or introduce any other variable. For all practical purposes, they are good for at least a few years.

Choices for Printer Profiles:

- ***If you're using an outside Print Lab, Use Printer Profiles provided by that Print Lab:***

Most quality print labs implement Custom Printer Profiles into their workflow, and should gladly supply them to you, but for **“informational” purposes only** (achieved by **“Soft-Proofing”** - see page 7). By following the 3 steps to Color Management listed on page 1, and setting up your file the way the lab needs it, you can achieve excellent results without ever physically visiting the lab - knowing how your image will look with a great degree of accuracy.

- ***If you're using your own Photo Printer – two choices:***

1) Use Canned” Printer Profiles for your Inkjet Printer –

If you can't afford a Custom Printer Profile, these generic Printer Profiles are available from the manufacturer of your printer or paper., and in general are quite good. However, they're not as accurate as a well-built custom profile, which will bring out the best in your printer. The reason for this is that a generic profile is based on an “average” – not your specific printer.

2) Use Custom Printer Profiles for your Inkjet Printer –

If you've never bothered with custom printer profiles because you thought it was too complicated or expensive, it is easier and more affordable than you think, and the results in your print output will be dramatic!

Why? Because all printers, even amongst the same make and model #'s, are different, and these profiles are designed specifically for your printer.

Watts Digital Imaging can create Custom Printer Profile(s) for less than you think ... see [my website](#) for more information, or use the QR Code to the right.



To Create a Custom Printer Profile for your Inkjet Printer: (This varies between Profiling Services)

Please Note: *It is NOT necessary to have your Monitor calibrated and profiled to CREATE your Printer Profile, only to USE your Printer Profile effectively.*

1. Download Profile Target(s) and instructions.
2. Print the Profile target onto the paper to be profiled with all Color Management “Off”.
(Use the free Adobe Color Print Utility - <https://helpx.adobe.com/photoshop/kb/no-color-management-option-missing.html>)
3. Mail the Profile Target to the profiling service.
4. The target is measured using a Spectrophotometer, and a profile is created.
5. The profiling service will email your profile to you (a file about 1 to 2 MB in size).

To Load any Printer Profile to your computer:

Note: *After loading the profile, restart Photoshop (if it was open) so it will recognize the profile.*

- **For Mac:** Go to “Primary Hard Drive” -> “Library” -> “ColorSync” -> “Profiles” and put your profile in this folder.
- **For Windows:** Download the profile to your desktop, right-click on the profile icon and click “Install Profile”. You can now delete the profile on the desktop. For your information, the path for the profile location is `C:\WINDOWS\SYSTEM32\SPOOL\DRIVERS\COLOR`

■ Step 3 – Assure that you have Proper Lighting Conditions and Perception

It has been my experience that of the three steps to proper Color Management in Photoshop the most overlooked is #3: **Assure that you have the proper Lighting Conditions and Perception.** I want to prove my point on **Perception.**

Have you ever walked inside a building after being outside in bright sunlight, and had to wait for your eyes to adjust to the inside lighting conditions? Our eyes adjust to the environment around us, which is why, when you are working on your images on your monitor, it is important to:



1) Change monitor screen theme colors to neutral gray

2) Reduce room lighting

3) Avoid “loud” wall colors

4) Be conscious of the color of your clothes – wear neutral grays and black, not a colorful Hawaiian shirt.

5) Use a Proper Light Source for Viewing your Prints - Your light source should ideally be 5000°K, or “D50”. The light fixture should be placed off to the side of your monitor - fairly close, but not so close that it causes major glare on your monitor screen.

There are many sources for 5000°K / D50 bulbs and fixtures, whether it’s the internet or at your favorite hardware store. You don’t need anything fancy - an inexpensive way to do this would be to buy 5000°K bulbs for the standard lamp fixture of your choice. If you need something a bit more “elegant”, try Solux products or Ott Lites, both an easy search online.

If you take care of these 5 steps properly, it makes interpreting what you see on your monitor easier.

Our eyes are miracles that God created – but even God has a sense of humor! 😊 - *Do not underestimate how easily our eyes (and by extension, our brain) can be tricked.*

Take a look at these websites for proof that **“Perception is not always Reality”**:

www.michaelbach.de/ot

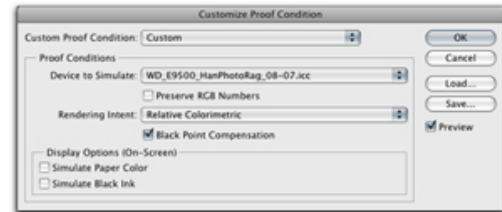
www.colorwiki.com/wiki/Image:Pink_green_dots.gif

“Rods and Cones are Nature’s Own, but our eyes will still deceive us ...”

***Bottom Line: You may not be seeing what you think you are seeing!
Give yourself an “edge” and eliminate as many variables as possible.***

■ (Optional) – Soft-Proof Your Image

Soft Proofing is a previewing procedure that Photoshop uses to “see” the results of your **Printer Profile**. In other words, it allows you to view on your calibrated and profiled monitor what your image will **theoretically** look like when it is printed (using your Printer Profile).



When to use:

I use it **VERY** rarely – and only when working with bright electric colors - mainly the three primaries (Red Green and Blue) - and never for correction in my Master File.

I use it basically for “informational” purposes, knowing that my bright red may look a certain way on the screen, but won’t necessarily look that way on the print – mainly because of a printers’ “**Color Gamut**” (the range of colors that a printer can accurately represent) and “**Tonal Compression**”



- Much more here on my blog (QR Code to the right): <https://blog.main.wattsdigital.com/?p=1873>

How it Works:

1. Go to “View” -> “Proof Setup” -> “Custom”
 2. Go to “Device to Simulate” and select your new paper profile from the drop-down list.
 3. Rendering Intent should be “Relative Colorimetric” and “Black Point Compensation” should be checked.
 4. Leave both “Display Options (On-Screen)” unchecked.
 5. Click “OK”.
- You can toggle this soft proof on and off by going to “View” -> “Proof Colors” or by using the speed key: **Mac:** “Command” + “Y” or **Windows:** “Control” + “Y”.
 - Soft Proofing is active when the profile name shows up in the Document Window’s title bar.
 - You can save this soft proof setup by clicking on the “Save” button. The saved name will now show up in the list, “View” -> “Proof Setup”.

Gamut Warning:

A **Gamut** is the range of colors that a color system can display or print. If your image has an “out-of-gamut” color, that color will not print as it is shown on your monitor (*again, a feature I VERY rarely use*).

- **To set up the gamut warning:** You should first choose a bright fluorescent color to show your out-of-gamut colors when the warning is active, such as Lime Green. To do this, go to “*Preferences*” (“*Command*”+ “*K*” on **Mac**, “*Control*” + “*K*” on **Windows**) -> “*Transparency & Gamut*” (From the menu on the left) -> “*Gamut Warning*” (double-click on the color box, and change to something like **RGB 255/0/255** in the **Color Picker**).
- **To Check Gamut:** Make sure that you are **Soft-Proofing** (A printer profile must be loaded), then go to “*View*” -> “*Gamut Warning*”. The areas that are out-of-gamut will show up as the fluorescent color you picked above.
- **To Turn Off Gamut Warning:** Go to “*View*” -> “*Gamut Warning*” and click it again. If you prefer, you can use the available speed key shown by the menu item.