

# Color Management - The Must-Know Basics

## Simplifying A Most Complex Subject!

You've put in many minutes, hours, or days tweaking your prize image in Photoshop for the eventual spectacular print. You have a simple goal; to match your print to your image as seen on your monitor. Now, when you print it out to your inkjet printer, you are appalled to find that the resulting print differs wildly from what you see on your monitor! You can reduce your frustration by learning some basics of color management and adding some simple procedures to your **color-managed workflow**. Color management is a very complex subject that has spawned entire books! This article attempts to offer a simplified approach to a common task: managing color in images destined for inkjet printing.

### The Fundamental Issue

The problem is this: There are several devices involved in getting your image from camera to final print - what we call your **Digital Workflow**. Your digital camera or scanner captures the image; your computer monitor is used by *Photoshop* for displaying and editing the image, and a printer outputs your image onto paper, or your image is viewed on a website. Here's the thing: *each device in the chain interprets and reproduces colors in a unique way*, and unless you intervene, these devices don't "talk" to each other in order to come to an agreement with respect to color standards.

### Terminology

Let's get some of the buzz-words out of the way. **Color Management** is a system devised to bring consistency to color reproduction across devices. A **Color Management System** (CMS) can solve this lack of color consistency by acting as a color interpreter. A CMS knows how each device interprets color. If necessary, it adjusts colors to keep them as consistent as possible as your image progresses through your digital workflow. With the proper color management settings in place, your colors will display and output more accurately to your printer.

Each device can capture and reproduce a limited range – or **gamut** – of colors, which is referred to as its **color space**. The mathematical representation of the color space of each device is stored in a small computer file known as an **ICC color profile** and is the key feature of any color management system. Your camera embeds a color profile into the image files it produces. *Photoshop* then uses this profile to determine how to display the document colors. If an image file doesn't contain a profile, *Photoshop* uses data from the current **working space** instead to display document color. Working space is a color space that you've chosen for *Photoshop*.

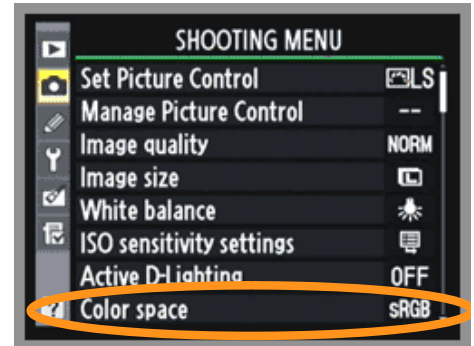
### Terminology

- Color Management
- ICC Profile
- Color Space
- Color Gamut
- Adobe RGB, sRGB
- Monitor Calibration

An important key to understanding Color Management is to realize that your digital darkroom actually contains three different versions of your image - the virtual image which resides within Photoshop (ie; computer data representing your image), the image you see on your monitor, and the image you print out. Given what we have discussed so far, we now restate our goal; to make both our *monitor image* and our *printed image* appear identical to our *virtual image*.

## Setting Up Your Camera's Color Space

Most of today's higher-end point-and-shoot and digital SLR cameras allow you to customize how the camera processes your digital images. Generally, when shooting in JPEG format, you should consider setting your camera's color space to **Adobe RGB**, which contains a larger color gamut than the alternative color space called **sRGB**. By the way, sRGB is usually the default color space in all cameras. You set the camera color space via it's menu system. Check your owner's manual for the details! Adobe RGB is generally best when the ultimate image destination will be your inkjet printer, while sRGB is best for images to be viewed on monitors – either via a slideshow or viewed on a website. It is also best for when viewing via an overhead RGB projector.



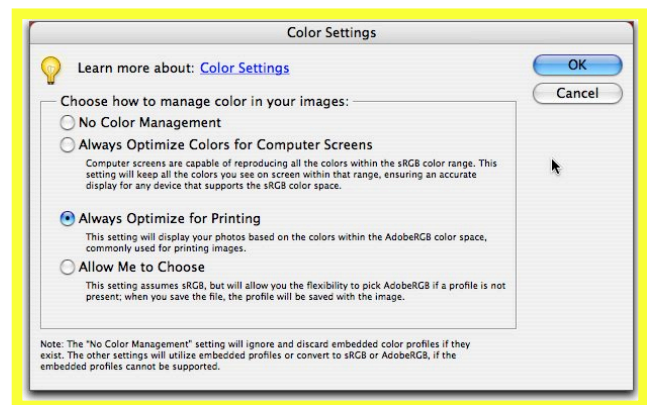
## Establishing a Color-Managed Workflow

Successful color management is dependent on three tasks:

- 1) Configuring Photoshop for color management - choosing a color space
- 2) Setting up your monitor to display images accurately, and
- 3) Setting up your printer to print images accurately.

## Photoshop Color Settings

Photoshop has special color settings that determine how images are handled in a color-managed workflow. In *Photoshop Elements* these settings are accessed by choosing **menu: Edit>Color Settings**. In the Color Settings panel that appears, be sure to read the instructions and descriptions for a better understanding of what is about to happen. Basically you will decide whether to use **Adobe RGB** or **sRGB** depending on your output – to your inkjet printer or to be viewed on-screen (including websites). By the way, on-line commercial printing services, such as Mpix or Shutterfly, will require **sRGB**. You should not select the “no color management option.”



## Monitor Calibrating and Profiling

**Monitor calibration** sets your monitor's parameters to standard values while **monitor profiling** creates a **monitor profile** (an ICC color profile), a computer data file that describes the way your monitor reproduces color. *Photoshop* uses this data when it displays your image for editing on your *calibrated* monitor. Your monitor's profile is created and saved during the monitor calibration procedure. The best way to calibrate your monitor is with a hardware sensor called a "spectrophotometer." More about this later. It is best to calibrate and profile your CRT or LCD monitor regularly and often. The frequency depends on factors such as the quality and age of your monitor. The older your monitor, the sooner it becomes mis-calibrated. This is especially true of older CRT monitors. Also note that LCD monitors made since 2004 hold their calibration better than typical CRT monitors.

## Printer Profiling

A **printer profile** (an ICC color profile) is very important to your color-managed workflow. Like a monitor profile, the printer profile is a data files that describes how your printer interprets color based on the paper and inks being used. Printer profiles are supplied by your printer manufacturer and are typically installed onto your computer when you first set up your printer and run the supplied printer installation software. The profiles are part of the "Printer Driver" software; when you install a printer driver you are also installing printer profiles. A manufacturer of photo-quality inkjet printers will typically provide a separate profile for each paper type they make. Profiles can also be supplied by third-party paper manufacturers for your particular printer when using their papers. Finally, printer profiles are regularly updated and you should periodically check your printer or paper manufacturer's website for "driver" or "profile" updates. This is particularly true whenever there is a change to your computer operating system.

For successful printing, it is essential that you have and use the appropriate profiles for each printer/paper combination that you use. *Photoshop* uses these profiles to convert the color values from your editing working space to the printer space. ***It is essential that YOU select the proper printer/paper profile from within Photoshop and during the printing process.*** *Photoshop* will not do it for you!

It needs to be mentioned that you can make your own printer/ink/paper profiles using special hardware and third-party services, but this is beyond the scope of this article.

## ICC File Locations

This is FYI only! It's intended for the curious. Do NOT move or delete any ICC profiles from your computer except for troubleshooting *and* if you understand what you are doing!

**Mac:** <drive>Library/ColorSync/Profiles (admin)

or <drive>Users/<username>/Library/ColorSync/Profiles

**Windows:** C:\Windows\system32\spool\drivers\color (look for .icm files)

## Seven Steps For Successful Color Management

1. Choose a **Color Space** (eg; sRGB, AdobeRGB).
2. Purchase a good monitor.
3. Set-up a **Color-Aware** work environment - Watch for surrounding color influencers (colors of walls, window light, ambient lighting, etc).
4. **Calibrate** and **Profile** your monitor.
5. Purchase a good Photo-Quality printer.
6. Use the printer manufacturer's papers and inks.
7. Use 3<sup>rd</sup>-party papers **only** if their **ICC Profiles** are available (eg; RedRiver.com).
8. Test your **Color Management System (CMS)**.
9. Enjoy your color-managed prints!

Monitor Calibrators (Pricing Effective 12/09)	
<b>ColorVision Spyder3Express</b> (\$82 @ Amazon.com)	www.ColorVision.com
<b>Pantone Huey MEU101</b> (\$63 @ Amazon.com)	www.Pantone.com
<b>X-Rite EyeOne Display LT</b> (\$120 @ Amazon.com)	www.XRite.com