



Using Profiles for Fun and Profit

The use of software profiles remains a poorly-explained topic, with the result that many photographers avoid taking advantage of this powerful and convenient mechanism. Struggling amateurs should recognize that virtually all professional photographers, seeking the greatest possible efficiency of time and material, and consistency of results, are using both monitor and printer profiles.

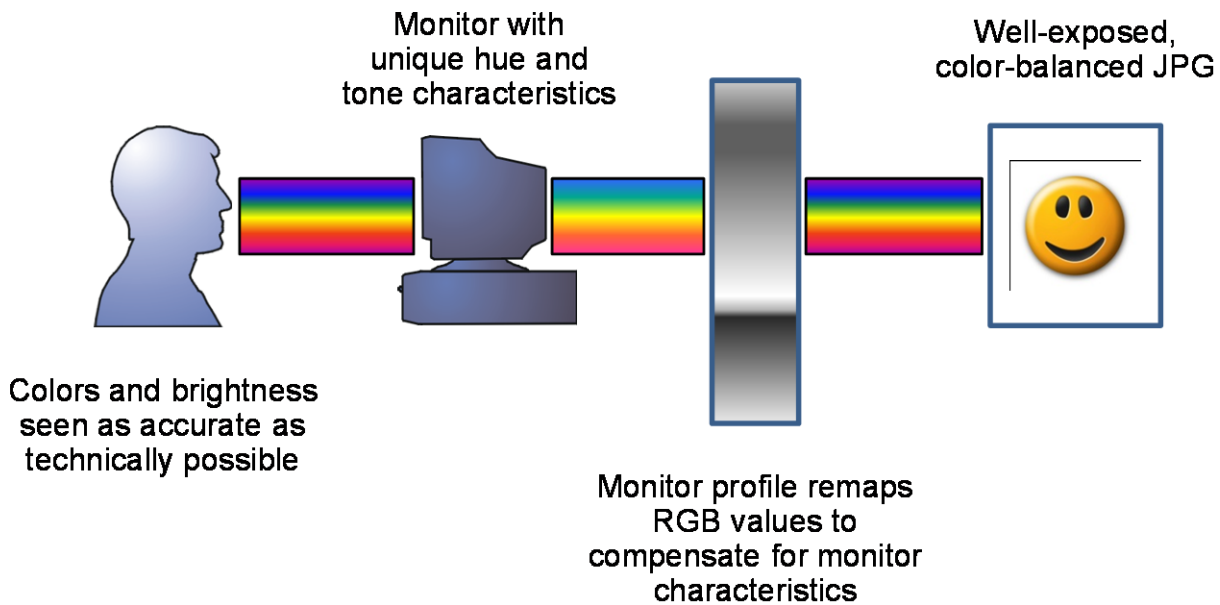
Anybody who is routinely participating in club print competitions, or hoping to sell some of their prints should seriously considering the use of profiles. Signs that you are unnecessarily wasting your time and money, let alone talent, include:

- You are consistently disappointed with the appearance of your prints.
- You regularly print more than one copy of a print, fiddling with exposure or color balance.
- You always make a specific change in photo brightness in Photoshop before printing.
- You change the exposure, color balance, contrast of a photo in Photoshop just for printing purposes, storing separate print and view versions, unclicking the layers, or throwing away that final bit of compensation work without saving it.
- You want to use paper that doesn't come from your printer manufacturer.
- If you want both a print and electronic copy of an image, you have to change its exposure in Lightroom or Photoshop.

What are ICC profiles?

Your operating system, be it Windows or Mac, has software drivers that allow monitors to display and printers to print. The operating system maps the set of colors in an image to the limited set of colors that can be displayed or printed (referred to as the 'color space'). This generic process is good enough for most purposes, but the unique characteristics of individual monitors, and the wide variation between different printer papers means that

compensatory mechanisms are needed for reliable use of computers for printing photographs. Profiles are like filters, applied within software, to correct to the degree possible, differences in hue and tone. Any photo manipulation software intended for pros or advanced amateurs, including Adobe Photoshop and Photoshop Elements, Lightroom, and Apple Aperture, can take full advantage of monitor and printer profiles.



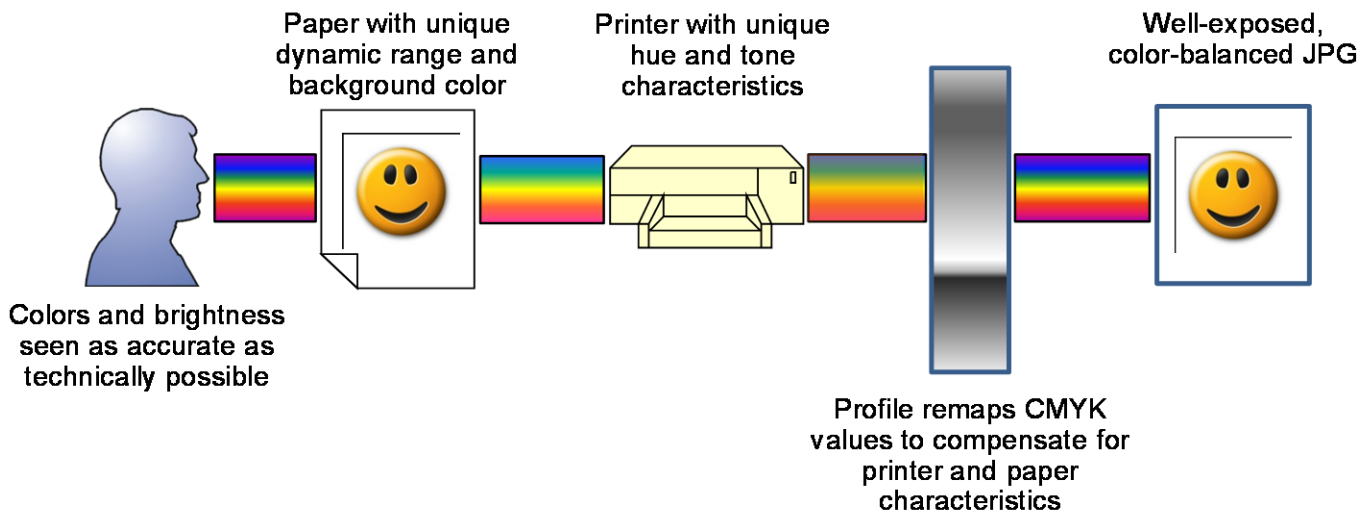
Monitor profiles:

The unfortunate fact of computer life is that every individual monitor has its own unique characteristics. While it is possible to take advantage of printer profiles without profiling your monitor, it is difficult and frustrating. If you find that your pictures are consistently coming out too light or too dark, it's because your monitor is either too dim or too bright. If you struggle with facial hue, it may well be that your monitor is too magenta or too green. Profilers start at about \$150, and you are better off buying a cheaper monitor and profiler, than spending all your money on an expensive monitor and not profiling it.

The diagram above illustrates the role of a monitor profile. Monitors are color additive devices, in which different levels of red, green and blue light are combined. A monitor profile modifies the RGB values provided by the generic monitor driver, correcting color and brightness so that the display reflects the

original image as accurately as possible. Remember that no monitor can ever display the full color and dynamic range of an image captured by a modern DSLR.

Monitor profiling is a relatively simple process, and should be performed periodically, because monitors do change their characteristics. Software is run that spends about ten minutes methodically displaying different colors at different brightness levels. A sensor plugged into a USB port sits on the face of the monitor, measuring the output. At the close of the calibration session, the software calculates the degree of compensation needed for each of R, G, and B, it creates a profile, and stores it in the appropriate place. This process usually requires very little effort from the photographer, and once the profile has been created, it is automatically applied when the machine boots up.



Printer Profiles:

Printer profiling is more complex, requiring more attention and effort from the photographer. Different printer papers have huge differences in their dynamic range, and both the color and type of the paper impact what can be displayed, and how much ink or pigment it takes to print any specific color. The printer driver routines that come with exhibition-quality photo printers typically do have options to choose between several of the printer vendors' most popular paper choices, including gloss, semi-gloss, and matte, and the software makes some attempt to take its characteristics into account. While this is often adequate for casual use, it is rarely satisfactory for competition work. Canon and Epson also offer a function in their printer driver to provide automatic correction of exposure and color tone. Referred to as PhotoEnhance by Epson, this is the equivalent of taking your negatives to the corner drug store for printing. While this may often result in a pleasing print, you are letting the printer make creative choices about tone, hue, and contrast, and you don't know what it will look like until it has been printed. The easiest and most reliable way to create prints that look like what you expected is to use a purpose-made profile for each combination of printer and paper.

The diagram above illustrates how printer profiles act as a correction mechanism ensuring that the Cyan, Magenta, Yellow, and Black values sent to the printer will result in a print that matches the original image as closely as possible.

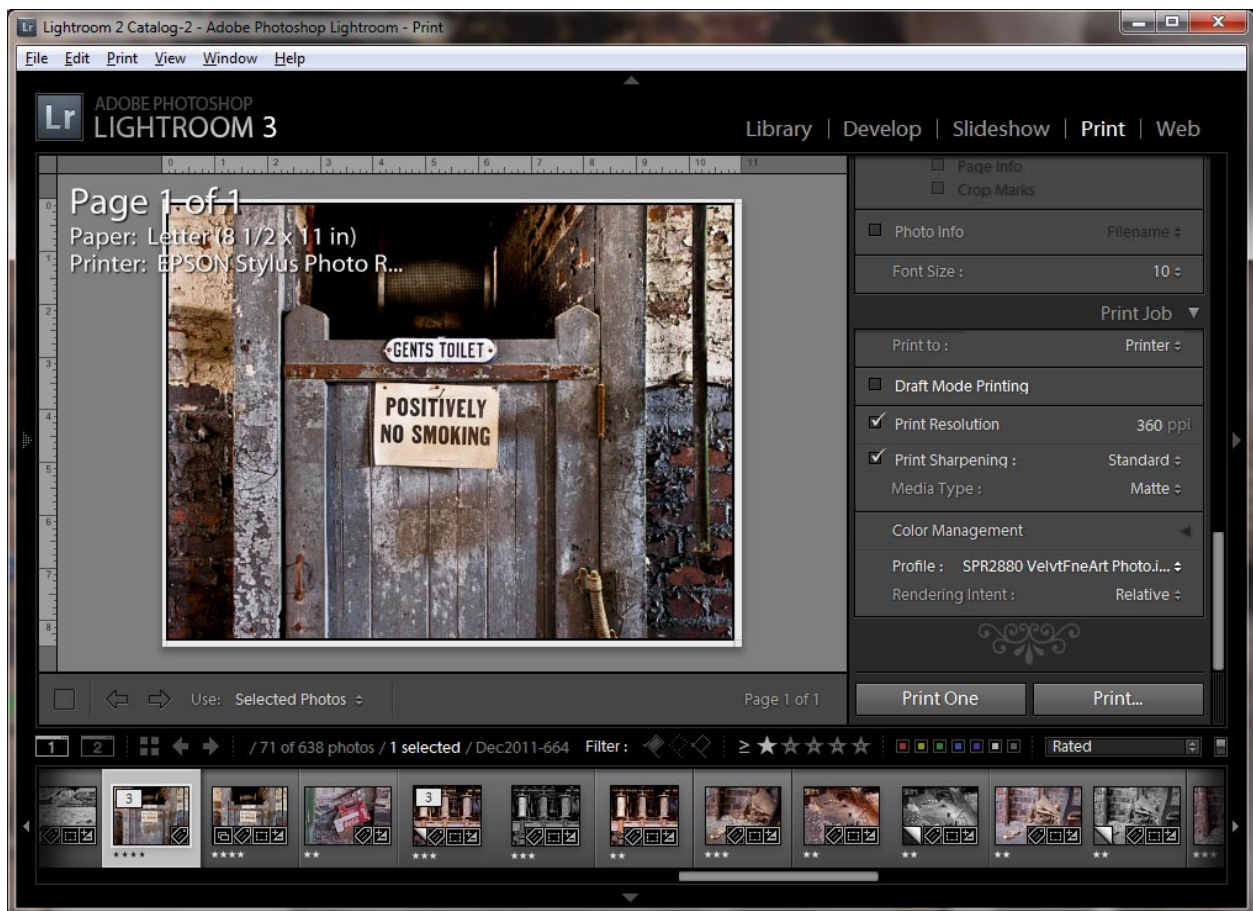
Today's printers, along with their pricey cartridges, are extremely consistent. Paper mills also have very high quality control standards, with the results that both the printer makers and the independent paper suppliers are offering products with a high level of consistency from box to box, and year to year. This means that you should have excellent results by downloading the profiles provided by the paper supplier. Not only do Epson, Canon and HP provide profiles for each of their printers for all the papers they sell, so do most independent vendors. Recognizing that serious photographers won't buy their paper without them, companies such as Canson, Inkpress, Moab, and Red River provide a selection of profiles for each of their papers for all of the current photo quality printers, along with many discontinued printers. Every printer and paper maker has a website where you can download profiles for specific printer/paper combinations into the appropriate directory on your workstation.

For Windows: C:\Windows\System32\spool\drivers\color
 For the Mac: \Users\Library\ColorSync\Profiles

Using Printer Profiles:

Printer profiles come into play when you print an image using photo manipulation software. It requires making the correct choices for the software's printing routine, and the printer manufacturer's print dialog. Lightroom has a very friendly print process, as shown below. Under color management, choose the appro-

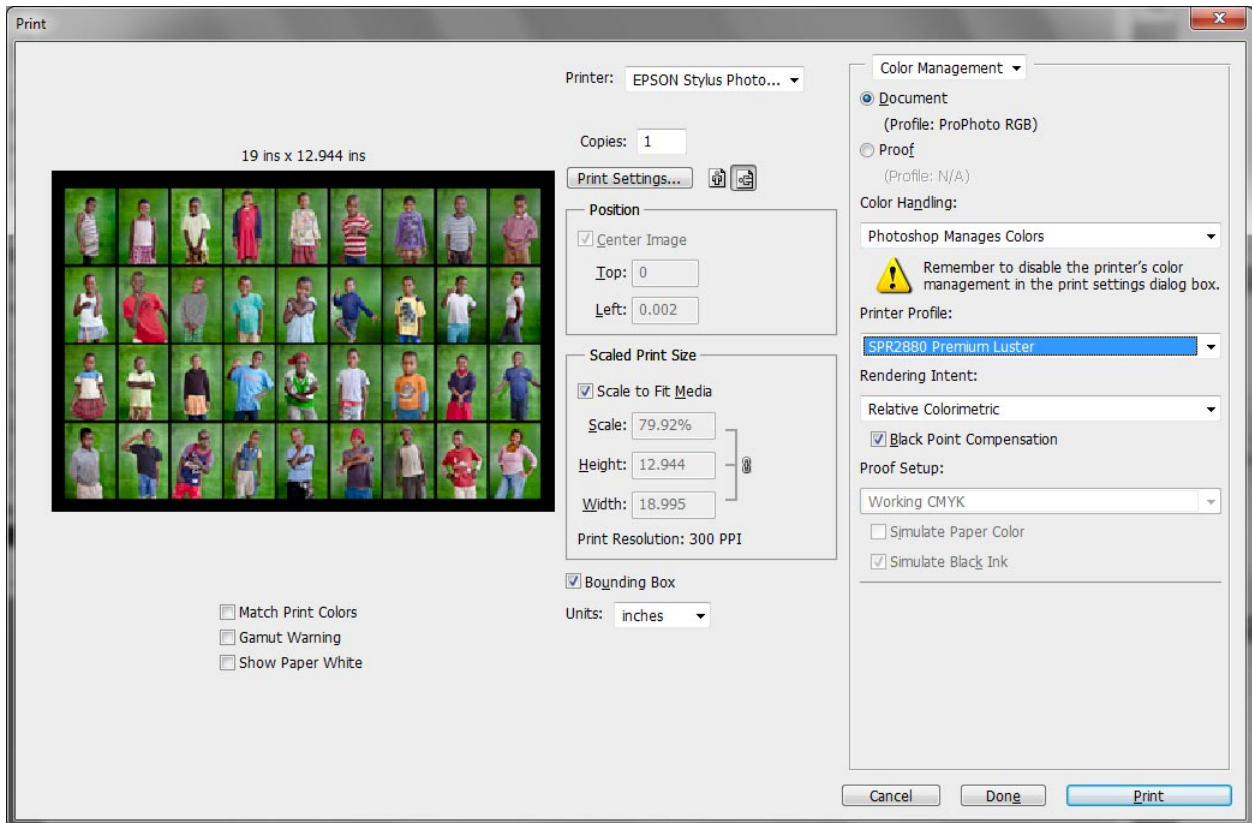
prate profile for your printer paper combination. The image below shows the profile for the Epson 2880 printer using Velvet Fine Art paper. In most cases, you'll want to choose 'Relative' for the rendering intent ('Perceptual' will reduce saturation—you may need to experiment).



Using Printer Profiles (continued):

The image below shows the Photoshop printer dialog. Although it has more options, the same basic choices are the same: specify that

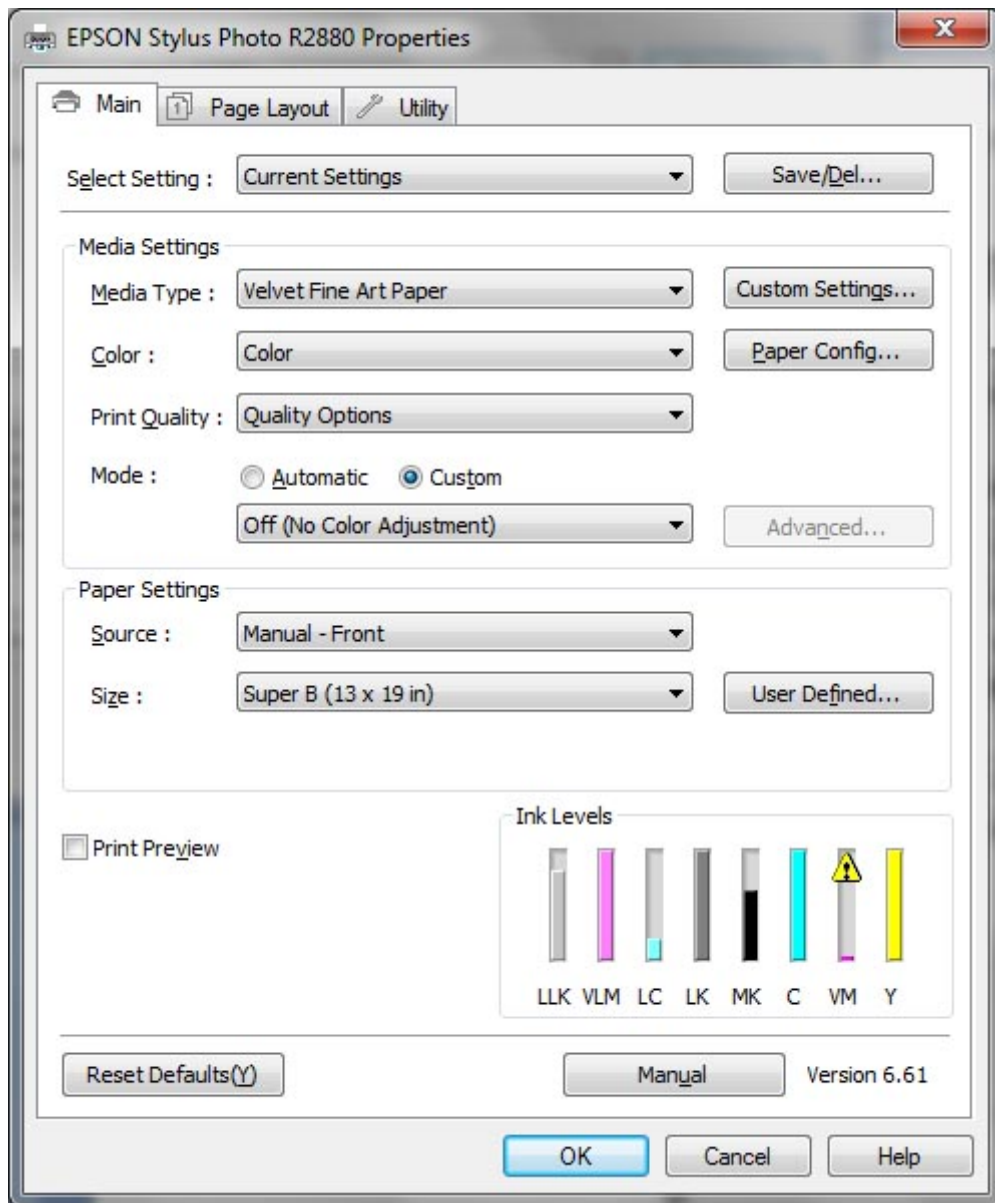
Photoshop manage colors, not the printer, and choose the desired profile.



Using Printer Profiles (continued):

Every photo quality printer has its own properties menu, but the basic principle remains the same. Do not choose ICM (Integrated Color Management), do not choose any of the vendor's Color Controls. On my

printer, by clicking 'Custom' under 'Mode', I have a choice of 'Off (No Color Adjustment)'. By choosing the options shown below, I have configured my printer to accept exactly what Lightroom or Photoshop sends it.



Printing Black and White:

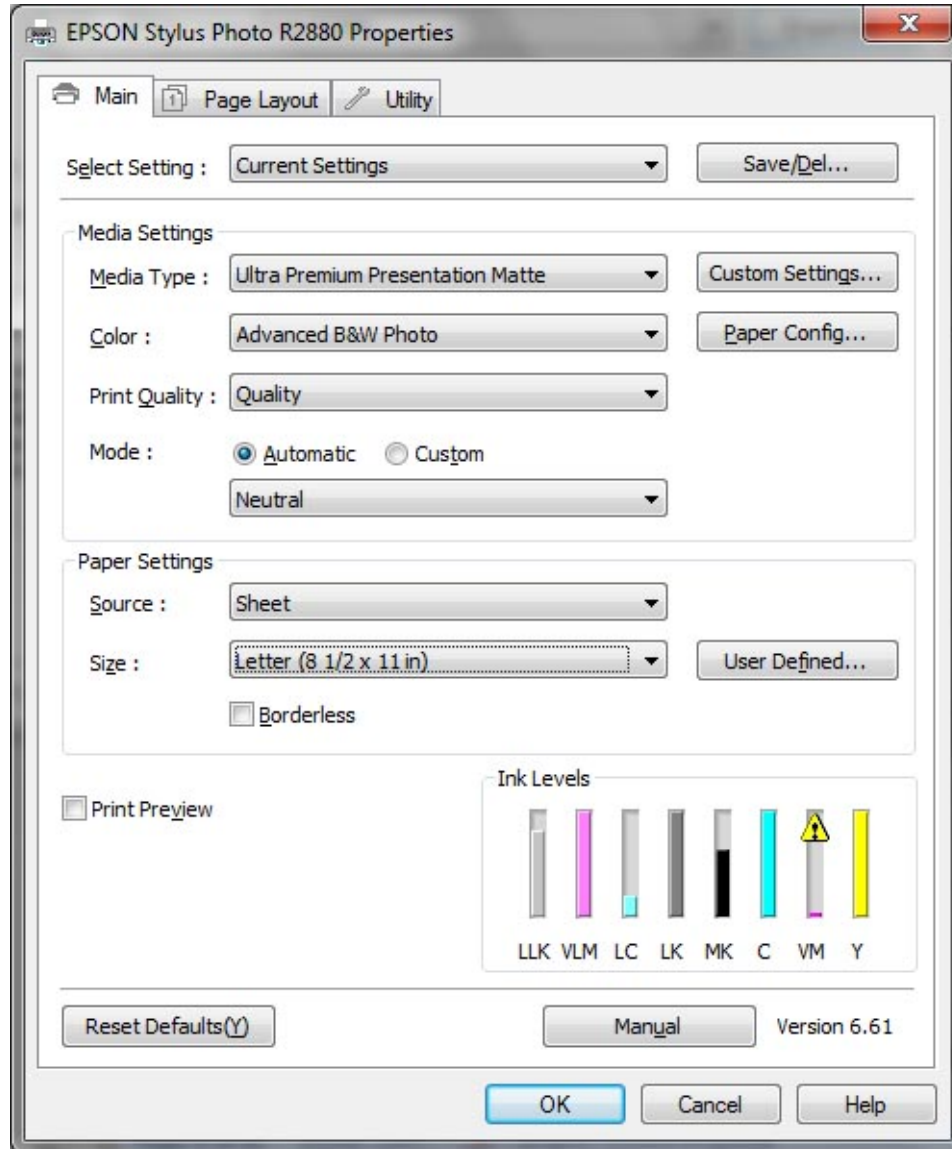
Printing a neutral B&W print with rich blacks can be challenging. Relatively new printers from Epson and Canon can usually print a perfectly acceptable image. If you do find that prints have an unacceptable color cast or muddy appearance, you have two choices. One choice would be to add a tone to your image, such as sepia, which will still meet club competition monochrome image standards, while compensating for the non-neutral printer

output. This is usually the best approach for an older printer with only a single black cartridge. If you have a printer that supplements the black cartridge with one or more gray cartridges, then the profile workflow above should work fine. If that does not work, then you may well find it easier to NOT use profiles, relying instead on the printer's B&W mode. As shown below, this image is being printed with color management turned off ('Managed by Printer').



Printing Black and White (continued):

You must then choose the correct mode on the printer dialogue. For recent Epsoms, this is called 'Advanced B&W Photo'.



This will result in a perfect black and white image, with no hint of color tone, and most photographers find that the exposure and contrast turn out fine. If the print turns out too light or too dark, then there will be a setting somewhere in the printer dialog that let's you adjust appearance. With the Epson 2880, clicking 'Mode' 'Custom' provides you with

access to an 'Advanced' setup window with options for brightness, toning, and other adjustments. If you find it useful to make a custom setting like this, then you can save that printer setup ('Save/Del...' button for the Epson 2880) and reuse it for future prints, which is much easier than trying to adjust brightness in Photoshop or Lightroom.

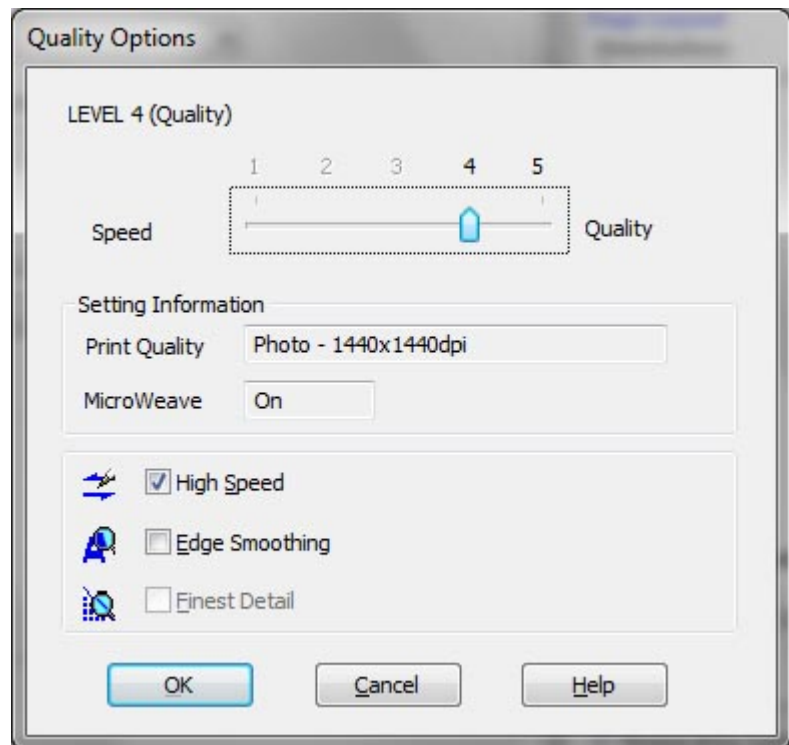
A Quick Word on Resolution and Quality:

All of today's photo quality printers have output resolution that exceeds what is needed for fine art prints, let alone for competition. Choosing the maximum quality on the 2880, the 'Super Photo' setting, Quality Level 5, which is a whopping 5760x1440 dots per inch (DPI), means that you will be spending more money on ink cartridges, but probably not improving print quality.

DPI is a printer characteristic that is related to, but not exactly the same as Pixels Per Inch (PPI). The number of dots that the printer squirts onto the paper will always be higher than the number of pixels that are contained within an image, so do not attempt to make them the same. Although there are claims that image PPI should be divisible into the printer's natural dot density (1440, 720, 360 for Epson), I've experimented and have struggled to notice any visual difference, so I generally leave Lightroom 'Print Resolution' set at 360 and the printer at 'Quality' level 4 (shown to the right). The only time I've found an advantage in setting the printer quality at level 5, and setting PPI for 720, is when I have large areas of light color, such as sky, which sometimes show some 'banding' (fine parallel lines). Note that Epson provides two different profiles for each printer/paper combination, with one set intended for the highest resolution and one for lower resolutions. Increasing PPI will increase the time it takes to output a print job, and increasing DPI will mean that you use more ink, but it usually will not provide visible improvement in quality. If you experience moiré patterns or banding, then experiment with the

higher output settings of your software along with the highest quality setting of your printer.

When printing directly from Photoshop, maximum quality is obtained by resizing your image (shrinking or enlarging to match your intended print size) so that it has a resolution of 280-360 pixels per inch of printed output size. Resizing must be followed by a final and manual application of software sharpening. Lightroom is much easier because it automatically resizes your image, and applies appropriate levels of output, based on the output size from the printing dialog. All that is necessary in Lightroom is to choose the degree of print sharpening and the media type. Likewise, when exporting pictures (to JPG or TIFF) in Lightroom, the media type and degree of sharpening needs to be specified in the export dialog, allowing the built-in resizing and sharpening mechanisms to properly do their job.



Conclusion:

The only hard and fast rule of printing is that, once you've figured out how to apply them, monitor and printer profiles make your life a lot easier. In most cases, the more money you spend on paper, the better looking your images, although there may be some papers that are not compatible with your printer, so check to

make sure that vendor profiles are available before buying a box of expensive fine art paper. Don't get hung up on resolution or printer quality settings. Experiment to see what the lowest levels of PPI and DPI work for you and you'll spend less money and time printing your photos.

Notes
