Digital Image Handling: Best Practices

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Writing an article on digital image handling that might be useful for photo editors, stock agencies and photographers alike was challenge enough. Adding the "best practices" angle and a 4,000-word limit for an audience that ranges from beginner to expert deepened the challenge. There are differing opinions on many of these practices, so please consider the aspects of what I put forth in this article as jumping off points where you can begin your digital journey. Some of what I am about to tell you is basic; some is more esoteric. The text reflects the FAQs (frequently-asked questions) that I receive as the director of photography for Barnes & Noble Publishing from photographers, designers and photo editors. Many of these professionals just want someone to tell them what to do without the lengthy explanations as to why. If you are one who wants to know why or is looking for more depth, visit www.webpendix.net, which is full of places to continue your education.

Calibrating Your Monitor — Walk into any electronic store and look at the wall of TV sets. Chances are that most are tuned to the same station and that you'll see obvious differences in the color between various TVs. Computer monitors manufactured by different companies, often in different countries, vary in color output as well. Macs and PCs both have basic software built-in for monitor calibration, but neither is up to the task, since they rely on your highly subjective eyesight.

You have to be able to trust *something* in the digital image supply chain, and your monitor is the correct place to start. You don't have to go out and buy a 19-inch Sony Artisan (though that's a great idea), but you do need to calibrate your monitor using a device built specifically for the job. There are several manufacturers who make excellent devices. Pick one and calibrate your monitor once a month. You can't accurately judge color, tweak files or get your printer to match your monitor if it isn't calibrated. And though this may be a new term to some of you, note that while you are calibrating your monitor, use a target gamma of 2.2 regardless of your operating systems. Calibrating your monitor is one of those "must do" items. Depending on the manufacturer's software license, one device can usually be used for all your monitors.

Your Workspace — Darker, more neutrally colored workspaces are better than those that are colorful and brightly lit. If you're in an office building, try to get the overhead fluorescent lights turned off and instead use a desk lamp or two with daylight bulbs. If you are outputting to a color printer then you also must have an accurate place to view the prints, which means either the mid-day sun or a light booth, the latter of which is more dependable. Judging the color or quality from your state-of-the-art, 7-color inkjet printer in fluorescent light, or a normal desk lamp is completely inaccurate. Make your own viewing area with 5,000k bulbs or buy a little viewing station (approximately $400), and you'll begin to see what your prints really look like. Now you are starting to manage your color.

Hardware Reality — It doesn't matter whether you use a Mac or a PC. Both are excellent operating systems with much more in common now than a few years ago. I work on both platforms every day, and they both amaze and frustrate me with equal frequency. While most graphic design departments and many photographers grew up with Macs, the split is much closer to 50/50 now. They are just tools that you need to learn to use better.

If your Mac or PC is more than three years old, replace it with the fastest machine, packed with the largest hard-drive and the most RAM you can afford. If you work with large files (over 25Mb) make sure to max out the box with as much RAM as it can hold: 512 megs at a minimum; a gig of RAM is better, and if your machine can take 2 gigs, count your blessings, slap down the plastic, and pony up for that RAM. Your time and your sanity are at stake here. When you've started with a single 16-bit, 46Mb file, added some other elements from other image files, added an adjustment layer or two, some layer masks, maybe some type, a few drop shadows and more, you'll find yourself working with a 200- or 300Mb file before you know it.

Software — There is really only one program for working with almost every type of image file, and that's the ubiquitous Photoshop. While version 7 was great, the upgrade to the latest version, dubbed Photoshop CS, brings more must-have features than I can mention here. Just do it. Note that the specific instructions that I'll give will be from the Mac version of Photoshop, which is 99 percent identical to the Windows version.

Photoshop Setup — If you really don't care what your color looks like, then skip this paragraph. In Photoshop CS, pull down from the menu bar as follows: Photoshop | Color Settings and then let go. (If you have version 7, don't fret. Instructions are on www.webpendix.net.) You'll be greeted by the Color Settings dialogue box. Most users don't need the options available in the Advanced Mode, so I won't cover them here.

See the Working Spaces area? That should really say "Working Color Spaces" since we're talking color space. Change the RGB space to Adobe RGB (1998). If you're not going to a 4-color press (magazines, books, calendars, etc) or if you are not responsible for getting the image ready for pre-press, then you don't need to concern yourself with the CMYK space or the other two listed. We'll discuss basic CMYK conversions later. Under Color Management Policies, set all three to Preserve Embedded Profiles. In the two rows labeled Profile Mismatches and Missing Profiles, check all three of the boxes and then click OK. Then pull down to Photoshop's Preferences | File Handling, and make sure that Append File Extension is set to Always.

File Formats — If someone delivers a picture to you saved as a JPEG, open it, save it as a TIFF (with no compression) and never resave it as a JPEG again unless you need it for the web or to send via email. JPEGs compress files to make them smaller and compression degrades images, period. If you scan transparencies or flat art, save them as TIFFs from the start, never as JPEGs. In other words, if you are ever going to print the image, TIFFs are good, JPEGs are bad. For the web, or as a quick reference, it doesn't matter, since monitors are very forgiving at their low resolution. Most stock agencies deliver their images as JPEGs, unfortunately, though a few are starting to deliver their images as uncompressed TIFFs. Do I prefer these larger files for use in the Barnes & Noble wall calendars I work on? You bet. Do they take longer to download? They certainly do, but the better quality is the issue now, not the bandwidth. If you have a low bandwidth connection, ask for your images on a CD if necessary. Of course, if the final image is only going to be enlarged to a quarter- or half-page, it matters far less. Just remember, each and every time you save an image as a JPEG you degrade the image slightly. The more you compress it, the smaller the file but the more the degradation.

Camera File Formats — For the past few years some of the higher-end cameras have been able to capture images in different formats, including JPEG (smaller, enabling more images to fit on the memory card, but with the above-mentioned problems), TIFF (excellent quality though the files are much larger). The newer kid on the block is called Camera RAW format. This is basically a raw capture of the digital information without the camera's internal software applying much math to the image (to make it into a TIFF or a JPEG, for instance). Camera RAW is awesome, capturing in 16-bit just what the camera saw. What's so great about 16-bit vs. 8-bit capture? 65,536 shades in each of the Red, Green and Blue channels as opposed to 256 shades in each RGB channel in 8-bit. That's a great deal more information to play with. It requires more "processing" in Photoshop, which means more time, but the payoff is worth it. If you are a stock agency and your photographers are out shooting digitally, they should consider capturing in RAW. Whether the "processing" of the image into 8-bit TIFFs is done by the photographers or the stock agency is a business decision both need to make. Some agencies are already asking their photographers to shoot RAW, for many reasons, though here is one: if you want to make an extreme enlargement from your digital file and you can start with the 16-bit RAW file, you'll have tons more information with which to interpolate upwards. There are additional file formats for photographs, of course, such as Photoshop's native PSD, plus EPS, JPEG-2000, PNG and DNG. DNG is Adobe's new initiative to get all of the various flavors of RAW to play nicely together. They call it the Digital Negative format and there are strong cases being made for its adoption.

Color Space — At the risk of causing eyes to glaze over, I'll keep this brief and non-technical. Think of color spaces as buckets of color. These buckets come in different sizes and shapes. What you want is a pretty big bucket of color (i.e. a fairly large color space) one which can capture all the glorious colors around you, but not so big that it contains many colors that you probably can't reproduce on a printing press or an inkjet printer without jumping through hoops. The de facto standard for many in the industry is called Adobe RGB (1998). Although it has some trouble with bright fluorescent colors, particularly lime greens and purples, Adobe RGB can hold most of the colors that you can hope to reproduce on a 4-color press. Many digital cameras and lower level scanners are set at the factory to capture images into a smaller color space called sRGB. Why would they do such a thing? Because low-end computer monitors, and the web in particular, are optimized for sRGB. But if you capture your image in a smaller color space, you'll never be able to get all those colors you missed. So make sure your camera or scanner has its color space set to Adobe RGB.

Image Size — Enlarging a digital file in order to make a larger print is called interpolation. When you ask Photoshop (hereinafter referred to as PS) to double the width and height of an image while keeping the resolution the same, it has no choice but to interpolate the image. That is, PS makes it up. Like a kid in high school inventing a really good story of why he doesn't have his homework, PS has to make up the new pixels. Luckily, PS is very good at doing this and PS-CS has a few new formulas that are better than ever. To see the existing size of an image, pull down this menu: Image | Image Size. In the Document Size portion of the window that pops up are three items to know, namely Width, Height and Resolution. I'm generalizing here, but the resolution should be 72 pixels / inch (ppi) for use on the web and 300ppi for most forms of print.

Often digital cameras show their Resolution at 72ppi, but when you view the dimensions in PS the Width and Height look wildly large. If so, here's what to do. By default the Scale Styles and the Constrain Proportions boxes are already checked. Make sure the Resample Image box is NOT checked, then change the Resolution to 300ppi. When you tab out of that field you'll see the Width and Height change to their real identities. Now at least you know the true size. All other quality and color issues aside, at 300ppi you can reasonably expect this image to survive printing in a high quality book or magazine (we're talking about 4-color offset lithography here). Inkjet printers can often get good results at a lower ppi setting, sometimes as low as 200ppi. Trial and error reign, and your mileage may vary.

Bigger & Smaller — To enlarge your TIFFs do the following: in the Image Size dialogue box (Image | Image Size) put a check in the box that says Resample Image. You're giving PS permission to make up pixels, to interpolate or resample. Note the word to the right of the Resample Image line, which says Bicubic. This it the formula PS is going to use to interpolate. Click in the box and change it to Bicubic Smoother. Then change

the width or the height to the larger value that you want and click the OK button. PS will resize the image and you should immediately pull down the File | Save As command and give the new file a new name. This is just in case you've gone too far and end up with an overpixelated image, and you now want to go back and try, try again.

How far can you enlarge it? *That depends...* on the quality of the original, on the quality of the scan, on the quality of the camera capture, and other factors. Here is an interesting aspect to ponder: you have two different TIFFs, each about 7"x10" at 300ppi; one was captured by a high-end 5-megapixel, while the other, originally a slide, was scanned to that same size by a high-end slide scanner. Both files are about 17Mb. For some reason you can enlarge (via interpolation) the image that was shot digitally much more than you can enlarge the image that was scanned from a slide. That isn't saying that having a digital file from a camera is better than having a chrome, it's just one of life's little digital oddities. A chrome, of course, can be drum scanned to as big a size as your budget allows, and the digital file from the camera does have a point beyond which you can't enlarge it.

There are experts who claim that every digital image needs some sharpening, whether it originates from a digital camera or is scanned from a transparency or print.

Profile Mismatches et al — Dating services have profile mismatches and so does PS. There are entire chapters of books written on this subject, authored by the gurus of color, and I can't begin to convey the depth of their understanding here. So I'll just tell you what can work for each of the messages that you might receive when PS starts opening a file.

When you set up PS with a working color space of Adobe RGB you're telling it that this is your preferred space. When you try to open an image from any source, such as a stock agency, PS looks to see if the color space of the new image matches your own chosen color space. PS wants to accurately render the colors in the new file. This part of the new file is called its *color profile*. If the new file is also in Adobe RGB then PS opens it immediately. If the new file has no color space / color profile attached to it, PS brings up a warning dialogue box and asks you how you'd like to proceed. Here is the dialogue box and the scoop on what to do.

Missing Profile — "The RGB document filename.jpg does not have an embedded color profile. How do you want to proceed?" This message means the owner of this image didn't attach a color profile (a color space) so it's up to you to do so. If you set up your PS Preferences as described earlier, the middle of the three choices in the dialogue box that pops up is *Assign working RGB: Adobe RGB (1998).* Choose that one, click OK, and see if you like the result. If the color looks good, then save it as a TIFF, making sure that at the bottom of the Save As dialogue box, you check *Embed Color Profile: Adobe RGB (1998).* Going forward, when anyone opens this file on a properly calibrated monitor, the colors will display accurately; a neutral gray will be a neutral gray.

Embedded Profile Mismatch — "The document "filename.tif" has an embedded color profile that does not match the current RGB working space. Embedded: ColorMatch RGB (for instance); Working: Adobe RGB." This message means that PS takes a quick peek inside the file that you're trying to open and sees that its profile is different from your working space. What to do? Note that the dialogue box also tells you what color profile is embedded in this new file. It may say something cryptic like *sRGB IEC61966-2.1.* How scary sounding is that? But it's just a flavor of sRGB, which you'll recall is a smaller bucket of color than Adobe RGB. There are even more opinions on the correct procedures to take at this point than in the last dialogue box, but due to space considerations and at the risk of oversimplification, just choose the middle selection: "Convert document's colors to the working space." The chances are good that you'll like the results.

Sharpening — There are experts who claim that every digital image needs some sharpening, whether it originates from a digital camera or is scanned from a transparency or print. The specific method by which you sharpen an image can be as simple or complex as you can imagine, so once again, I'll keep things simple. Most experts agree that sharpening should be the very last thing that you do to a file, after you resize the image to its final size and make any tonal adjustments. So if you are a stock agent or stock photographer passing a file along to another party, you should do precious little, if any, sharpening, since you don't know the client's planned reproduction size. Unfortunately, the reality is that the last person to adjust the image size is often a designer, working on a layout in Quark or InDesign, and he or she often resizes the image on the fly to fit the layout. This is hardly optimal! In the old days the designer would make an FPO scan (or stat) of a slide or print, finish the layout, and the image would accompany the layout to the separator. The separator would typically drum scan the image to the exact size needed, and drum scans need little or no sharpening. Now we have designers resizing the final digital files and not sharpening them at all.

What to do? First, always work on a copy of the file and keep the original elsewhere. Make your tonal adjustments first, then resize to the final size using the correct PS method of interpolation. If you are able to determine the final size, resize the image accordingly and do your sharpening. While there are scores of articles on sharpening, and several excellent software programs to help you do it well, I'll just give you the very basic settings so that you don't go away empty-handed. First, double click on PS's Zoom tool, the magnifying glass in the lower right corner of the floating tool palette. This will zoom the image to 100 percent. If you hold down the spacebar you can reposition the image. From the pull down menus do not go to Filter | Sharpen | Sharpen. Instead, go to Filter | Sharpen | Unsharp Mask. This brings up the Unsharp Mask dialogue box. If you

are working on a high-resolution image (300ppi) try these settings: Amount: 125 percent, Radius: 1, Threshold: 3. Experimentation can help you come up with your own settings for various types of images. Here are some ranges that you might try: Amount 50 percent to 150 percent; Radius 1 to 2; Threshold: 3 to 20. Your mileage may vary depending on your own files, so please consider these mere points of departure.

What about CMYK? So far, we've been dealing in RGB files. If your client wants CMYK, can you just let PS do the conversion? The answer is a definite maybe. If your image is going to be reproduced on a 4-color press, like every calendar, poster and coffee table book, then someone somewhere has to convert your RGB image file to CMYK. The key however is to get the correct CMYK ICC profile from the actual company that is going to print the calendar, book or whatever. Don't be tempted to simply do an Image | Mode | CMKY Color conversion in PS which will change it into some mystery flavor of CMYK. Chances are that it won't convert it correctly for the specific printing press. If you want to read up on the conversion process so that you can Do-It-Yourself with PS, you can exercise more control and have greater success in the final reproduction, provided you get the right CMYK profile from the printer or separator. When you get that profile, load it into PS, and choose it in the Color Settings dialogue box (above).

Meta information — Embedding your copyright information into a hidden part of the image file structure called the metadata is a good habit to cultivate. In addition to the usual copyright info, you can include keywords, captions, filename / number, your website address and lots more. While you have been able to embed some of this information for several years now, PS CS (and its supercharged File Browser) makes the task almost fun. Just open the File Browser, browse to a folder full of pictures, highlight one image, and then click on the Metadata tab on the left portion of the File Browser. That will show you all the fields in which you can enter your information. By clicking on multiple images at once, even all images in a single folder, you can, for example, add the same copyright and URL to hundreds of images at once. It's pretty cool. By the way, when you use a digital camera, a tremendous amount of metadata is captured in the Camera Data (EXIF) fields, including camera make, model, shutter speed, metering mode and more.

Getting Prints to Match the Monitor — The single most often asked question might be this: Why don't my prints match my monitor? Apart from the fact that the monitor uses emitted light (RGB) and the print uses reflected light (CMYK), the answer is found in a non color-managed workflow. To get much closer to a match, follow these relatively simple steps. First, calibrate your monitor so you are viewing an accurate rendition of the image. Then from within PS, go to File | Print with Preview. Make sure the Show More Options box is checked. Just below that checkbox is a drop-down menu, which you should set to Color Management (not Output). In Source Space, click the radio button next to Document, and note that your color space is listed (probably Adobe RGB). In the Print Space area, to the right of Profile, there is a scroll box. Scroll to find the printer and paper combination that you're using. Note that when you install the software for most printers, they install paper profiles for PS to use. The correct paper profile will give PS very specific instructions as to how to lay the ink on the paper. It is critical that you choose the correct profile. A paper profile on this list may look like this: SP2200 Enhanced Matte_PK. Then you need to choose an Intent, which instructs PS on how to deal with out-of-gamut colors. That is, colors that might be in your image but which are beyond the limits of your printer. For now, try Perceptual. Then check the box for Use Black Point Compensation. Tired yet? No? Good.

Click on Page Setup and then choose your printer in the center box, followed by the Paper Size. You may need to change the orientation (portrait vs. landscape) just below the paper size. Clicking OK brings you back to the main Print dialogue box. You should see a preview of the way the image will fit on your chosen paper size. Review the settings under Color Management and if everything looks good, hit the Print button. This will bring up the final Print dialogue box. Double check that the correct printer is chosen. Presets are probably fine set to Standard. At this point the Mac and PC dialogue boxes often differ slightly, but it is imperative that you find your way to the print driver settings for your chosen printer (Epson, HP, Canon, whatever). On the Mac, it is usually the third selection list, under Copies & Pages. Click and select Print Settings and choose your paper type (if it isn't listed, choose the closest match). There will be additional selections here specific to every printer, such as Print Quality (you want 720dpi or higher for photographic quality). Finally, change the Paper Settings selection to Color Management and then select No Color Adjustment. You don't want the printer driver, which is the software that is instructing the printer, to make additional changes to the image after you've already selected the correct paper profile earlier in the Print Space box, since that's the job of the paper profile. You may now, finally, hit the Print button and await the printed result.

If these steps are followed, from monitor calibration to the correct choice of paper profile through to the turning off of the print driver's feeble attempts to further color manage the image, your print should closely match your monitor (allowing for the difference in mediums). If it doesn't, first trace your steps. Second, consult the manufacturer's website since they may have downloadable instructions (PDFs probably) that can shed light on your specific printer. Don't overlook user groups and forums listed in www.webpendix.net for other similarly challenged users (and quite a few experts) who can help diagnose your situation. Once you discover the correct steps, the process is highly repeatable, after which you'll find your first or second prints nailing the vision that you see on your monitor.

Some aspects of this article have been simplified due to space constrictions. I hope that this basic overview helps you understand more of the answers to the current challenges of working with digital images. For more information on most of these topics please consult www.webpendix.net for books, articles, videos, DVDs, conferences and trade organizations that can further help you understand the complexities.

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