



Suggested Guidelines for Photography in the Digital Era:

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ASMP Digital Sources link:

<http://www.asmp.org/commerce/digital.shtml>

A revolution has quietly occurred that has forever changed the way Photography will be created, viewed, managed and printed. This revolution is similar to the revolution that replaced paste-ups with Quark. It will affect everyone in the chain, from client to photographer, to agency, to designer, to offset printer.

Those who take the time to educate themselves about the new technologies will reap the benefits, and those who do not will find themselves increasingly behind the curve. These benefits include greater immediacy in seeing results, potentially faster project completion, greater interaction between client, designer and photographer, and, if managed properly, greater accuracy of color reproduction.

In order to achieve these good things, a common set of digital photo file management standards needs to be implemented by the client, the agencies, the design firms, the photographers, and offset printers.

Digital Capture vs. Film: Even though digital capture is still in relative infancy compared to film, it is rapidly replacing film as the preferred medium for many photographers. The instant feedback is particularly useful for corporate and advertising shoots, especially those involving people. Heightened security at airports has made transporting film increasingly difficult and can place entire assignments at risk.

Film is risky even after processing in that there is only one original image. Once processed, film needs to be digitized by scanning. This necessarily involves a degradation of quality because the result is now second generation.

There exists a great deal of confusion regarding file sizes of scanned film vs. digital capture. This is because to get equivalent quality, a film scan needs to be 2 to 3 times the file size of a digital capture. This is partly due to the second-generation nature of a scan, and it is also due to the fact that the digital information in a film scan will not all be of useful detail. For this reason, storing digitally captured images is more efficient than storing equivalent-quality film scans. For instance, if you scan a 35mm transparency at 4000 ppi (pixels per inch, not to be confused with dpi-dots per inch, which refers to the resolution of a halftone screen), 16 bit depth, you generate a 120 MB file. This is probably the optimal resolution to be sure that you are getting the best possible file. However are you capturing 120MB worth of useful information? Most likely not, because sampling as finely as 4000 ppi means that the sampling is finer than the film grain. This means that some of the samples are of the edge of film grain, and some samples are between film grain. If you also consider the fact that the highest quality digital capture images are the so called RAW files, which are usually compressed by a factor of 50%, the efficiency of digital capture goes up even more. I have found that a 7.7 MB Nikon D1x raw file is more than equivalent to a 120MB 35mm film scan judged as either an inkjet print, or in offset reproduction.

Andrew Rodney (www.digitaldog.net) has on his web site, a discussion where he compares 18MB digital capture files to 4x5 scanned film, and concludes that "...in virtually every aspect, the digitally captured image file thoroughly outclassed the file scanned from film...".

These fine points are lost on some people in the industry (especially offset printers) who insist that digital capture images need to be as large as film scans to be of equal quality. Another piece of dubious information is that a digital capture image needs to 300 ppi at the final reproduction size in order to be successfully printed.

The 300 ppi figure is a legacy of scanned film, which as I have mentioned before is a less efficient means of digitizing a photo. A digital capture needs to be only 1.5 times the line screen resolution. Most line screens are either 133 dpi or 150 dpi. This means that ideal resolutions for digital capture images meant for printing would be in the neighborhood of 225 ppi.

Actual tests have shown that there can be a degradation of image quality at 300 ppi vs. 225 ppi. Intriguingly, the default resolution for Adobe's RAW file processor is 240 ppi.

If your offset printer does not agree with this premise, perhaps you can get them to run some tests for you. In some cases, 300 ppi is preferred by the offset printer in order to give them some head room

in case the image needs to be cropped or enlarged slightly. Another situation where 300 ppi may be preferred would be if the printer is using a 200 line screen. Use of 200 line screens is not always the path to higher quality, however. "The finer the screen ruling, the smaller the dots, but the smaller the dots, the harder they are to print properly. If they are on the cusp of what the press can tolerate, the following irritating things happen: • Darker areas start to plug up, resulting in perceived lower maximum shadow. • The minimum acceptable highlight dot goes up; at some point, a dot simply gets too tiny for the plate and the blanket to hold. Overall detail in the highlight will become inconsistent. • The image will begin to appear soft as the transition areas become less distinct. • Dot gain will appear to increase." Dan Margulies, *Professional Photoshop 6*.

There is, however, an important feature that film has which digital does not, and that is the ability of the photographer, client, agency, designer, and printer to judge the intended color of the image accurately, and without special software or equipment. In order for digital to work across all of these levels, there needs to be a way for everyone in the chain to view the image in the same way. The solution to this problem is called color management.

Color Management: First some background. Photography, whether captured on film or digital, is originally in RGB color: Red, Green, and Blue. This is also how our eyes see color—I'm sure we all remember rods and cones from high school biology. A transparency on a light table or an image on a computer monitor is an RGB image. When computers started to be used to display photos, a system needed to be worked out to translate RGB values into numbers, as computers can only work with numbers. The system involves 3 channels- the Red, Green & Blue channels, and each channel is divided into at least 256 discreet tones (or more if the file has 12, 14, or 16 bit depth) of those colors. By combining those 3 colors in various combinations, millions of colors can be described on a computer screen.

When an RGB image needs to be translated to the printed page, we need to convert from RGB to CMYK. CMYK stands for Cyan, Magenta, Yellow and Black. Theoretically we would only need CMY, except for the fact that printing inks are not as pure as RGB light is, and if you add 100% values of CMY, you get brown and not black. The black plate is labeled K. The black plate, besides giving us a real black, is useful for printing type, rules and other graphic features without having to worry about CMY inks hitting the same precise spot.

The problem is that every RGB and CMYK device translates the same color numbers slightly differently. Caucasian skin tone is roughly described as R 220, Green 190, and Blue 165. In CMYK, the numbers

might be Cyan 09, Magenta 28, Yellow 33, and Black 0. However, your monitor, if it is not profiled, will very likely display those values quite differently from a profiled monitor. This is because all devices have different color characteristics. If you've ever seen a wall of T.V. sets at Circuit City all tuned to the same channel, you'll see what I mean. Each T.V. is displaying the same color information differently.

What is profiling? Basically profiling a monitor means that you use a hardware calibration device with supporting software to optimize the monitor brightness and contrast, neutralize the monitor's display of color, and provide an .icc profile, which will become the default monitor profile used by color savvy applications such as Photoshop. Once profiled, the RGB numbers in a file are changed before they are sent to the video card so that your monitor displays them accurately. Once your monitor has been profiled, you should then check your Photoshop color settings. The Default color settings when installed are for Web, which assumes sRGB color space, and color management turned off. This needs to be changed to U.S. Prepress defaults- at least as a starting point. This changes the working color space to the wider gamut Adobe 1998 color space, and turns color management on. Your files if worked on and saved in this color space will now be "tagged" as Adobe 1998 files. What this means is that each file will have the Adobe 1998 color space embedded as a profile. This is important, because in color management, it is important that any profiled device should see that embedded color space profile in order to properly display a file, and then to be able to accurately convert it to any other desired color space, such as a specific CMYK space.

Although monitor calibration and profiling is the very least that everyone needs to do in this era of digital photo files, far too few clients, agencies, designers and even photographers are taking this seriously. If we also consider that many of us are using desktop printers, we see that if they are left as they are "out of the box", they don't even match our own screen, except in a very general way.

The color management solution for desktop printers is to get custom profiles for each type of paper that you are likely to use. There are several Internet services that do this. Visit their web page, read the instructions, download and print out a color chart, mail it back to them, and they will e-mail you a profile or set of profiles.

With a little bit of effort, the application of color management will allow your device and my device, and the graphic designer's device across town all give us the same version of a picture. That would be all for the good, but what happens when we go to offset printing?

In the CMYK arena, we have real trouble brewing. Many offset printers are still operating under the old paradigm: they receive color film and put it on a drum scanner which has been carefully set up and calibrated to their press conditions. This scanner converts RGB to CMYK on the fly, and all the pre-press work is done in CMYK. This is called a "closed-loop" system, and it has worked very well for many years and continues to work well as long as that offset printer is not having to deal with files (especially not RGB files) generated outside of his shop. Since there is only one scanner involved, there isn't a lot of difficulty getting original image color to match up to their proofing printer and presses.

The difficulty for me as a photographer was that although the results were often quite nice, they were never exactly as I had intended. This is because a technician was the final judge of color and contrast. Another difficulty with this system is that CMYK is not the ideal set of channels to do retouching.

Retouching and color corrections are better handled in RGB, where the picture originates. CMYK color is a very small gamut (range of colors) compared to RGB. It doesn't take many color moves in CMYK before unpleasant side effects such as banding, posterization and color clipping start to emerge. There is also the fact that CMYK files are very device dependent, meaning that files prepared for one offset printer, may not work as well on another company's presses. If you are going to spend a lot of time and effort (money) retouching that special file, it would be best to store it as an RGB "masterfile" so that it can be repurposed to any number of CMYK spaces.

Unfortunately, too many of today's pre-press technicians at too many printing companies are unfamiliar with working in RGB color.

At this point, we seem to have reached the point of maximum chaos in trying to produce a printed piece. We have digital RGB files being generated by photographers who fail to color manage them. These files are too often not tagged with a known color space. They are then handed off to clients who may not know how to look at them accurately. They are then passed on to designers and advertising agencies who "correct" the color without the benefit of profiled monitors and proofing devices, and then they end up at a printer's shop, usually still RGB, where the printer tries to convert them from an unknown color space to his CMYK space. This is where he complains about the "awful" color, and "flatness" of the image, and then tries to heroically correct the color in the worse possible space, CMYK. When the client or designers see the proofs, they may experience "shock" and when they get the printer's invoice they may experience "awe".

Recommendations: What to do? First we need to recognize that we are in a whole new set of circumstances. The methods of the past will only continue to frustrate. If a person's job description involves reviewing and evaluating photography, then they should equip themselves with a reasonably new (fast) computer with the latest version of Photoshop. They should also research, install and learn to use good Digital Asset Management software such as Extensis Portfolio, Canto Cumulus, or iView MediaPro.

It is a very good plan to have an external Firewire or USB2 hard drive of some reasonable size (120 Gig for instance) to serve as a back up and quick access storage for digital files. A fast CD burner and a set of shelves where CD's can be organized and stored are also essential. With digital photography, CD's are the current coin of the realm. DVD is another possibility. If your average job generates a half dozen CD's, then DVD storage would probably make more sense for you.

Photoshop out of the box has default settings that need to be changed. Photoshop color settings are found under the Edit menu (Windows) or Photoshop menu (Mac OSX). These settings should be changed from Web settings (the default) to U.S. Prepress Defaults. This ensures that your color space will be Adobe 1998, and that color management will be turned on. A printer I visited recently had complained that my digital files did not "look good" on his monitor. When I asked him to go to his Photoshop settings, he had Web defaults for his color settings. This meant that he was assigning the wrong profile to my files, and then stripping out the correct profile. Once a file is saved like that, the original color can never be recovered.

Since that time, I never take for granted that anyone knows how to set up their copy of Photoshop, so I always take them to that menu and check it with them. Next step is to get a monitor calibration device and software and profile your monitor. If you have a printer, get a profile for a glossy paper and a matte paper, so you can see the effect of printing on coated or uncoated stock.

Advertising Agencies: According to one survey I came across recently, some 62% of advertising photographers are using digital capture. Hopefully, this means that advertising agencies will become accustomed to digital files and color management. Those that have taken the time to train their front line people are to be applauded, but this is not yet universal. Case in point, I have gotten some of the strangest and most inappropriate photo files I have ever encountered from ad agencies. Although Photoshop supports almost every file type known to man, I have received files from one agency that had to be run through a hardcore program called "Graphic Converter" before

they could be opened. Needless to say, these files were untagged and I had to interpret the color based on sky being blue, grass green, etc.

A client should not accept this from any agency because it costs them extra time and money for someone down the line to sort this out. A file like that sent to the average printer is a recipe for disaster. It would be prudent for the client to at least have a discussion with their agency rep about some of these issues.

A proactive approach might be to send a letter to the agency requesting that people working on their account use profiled monitors, and use only TIFF or JPEG files in appropriate sizes, resolutions and quality. I would also recommend that Adobe 1998 color space be used as the standard color space, and that all digital files be tagged in that space.

Photographers: The center of the storm. A minority is very much on top of the digital revolution. Many others are using digital cameras without really understanding the workflow. Some are in total denial that film is rapidly losing ground to digital capture in the commercial arena.

Much progress is being made, however, and a few questions by a savvy client or designer can separate the wheat from the chaff.

Because of the current lack of RGB support by printers, it is my recommendation that photographers should be chosen not only for their "eye" but for their ability to handle color management, retouching and prepress.

There are service bureaus emerging that may come to replace the "color lab" with retouching and prepress services for those photographers unable or unwilling to do it themselves. Like I said, there is maximum chaos at the moment.

The good news is that almost all manufacturers' resources are going into new digital products. New cameras with increased resolution, full frame chips, new kinds of chips, and improved software for decoding RAW files, are being announced every few months. It's only going to get better for photographers, if, and only if, they have already invested in a digital infrastructure.

Unfortunately, getting into the digital photography business will be increasingly difficult as the cost of admission now includes very expensive cameras, laptops, storage media, computer workstations, printers, etc., all of which need to be color-managed.

Offset Printers: I feel that printers should be chosen on their ability to print. As long as the client has good support from their designers, photographers, and agencies, delivering good CMYK files to their printer should not be a problem.

Every printer that I have worked with has been willing to e-mail me his or her CMYK profile. If they don't profile their offset press, then get their proofing printer profile, since they are probably good at matching their own proofs on press. I have found that the best piece of information is to get them to send to me their Photoshop custom file settings (.cfs), which includes the CMYK profile as well as their Photoshop settings. This clues me in to whether they have Photoshop set up correctly to preserve the embedded profiles.

That being said, color management will only get you so far when it comes to offset printing. Offset presses can only be profiled up to a point. After that, the skill of the pressman, the paper choice, and even the humidity level the day of the press run become more important.

Our goal should be to give the pressman the very best file going in so he only needs to adjust for press conditions, and not try to make major color shifts due to problems in the CMYK files.

Summation: Despite the rapid changes occurring in the photography, design, and printing workflow, there exists now a set of standards that can simplify everyone's life.

Monitors: Monitors whether CRT or LCD needs to be profiled with a monitor calibration device. White points of 6500°K for web and 5500°K for print are good starting points. If you have a profiled printer and a color correct viewing booth or viewing light reasonably close to the 5000° standard, the proper white point can be determined by dimming the viewing booth while looking at a copy of the plain white stock you are planning to proof on until the brightness of the viewing booth matches the brightness of the monitor. Then you should adjust the monitor white point until it matches the proofing stock. Alternatively, you can profile the monitor to several white points from 5000° to 6500°, and find the color temperature that most closely gives you a match from monitor to profiled printer.

Desktop printers: Desktop printers should be profiled so that what you see on the monitor matches what is printed on paper as closely as possible.

Digital photography: There are currently 2 types of professional grade digital cameras. These are Digital SLR cameras, and Digital Backs that mount onto either medium or large format cameras. Both

of these professional camera systems produce the high-resolution wide gamut files necessary for high quality reproduction. Whichever type of system is used, they should be set on Adobe 1998 or equivalent color space. Whenever possible, the RAW file format should be used for maximum quality and color correction capabilities.

File types: Two file types should become standard, TIFF and JPEG.

TIFF (tagged image file format) Files are the most universally recognized industry standard image format. TIFF files can be compressed, but it is generally preferred that they be delivered in uncompressed form, usually on a CD. TIFF files can thus be large when not compressed, but they are a "lossless" format meaning they can be saved again and again without degradation. When uncompressed, they should be only the size and resolution required to conserve disk space and to speed up Photoshop operations.

TIFF files can be either RGB or CMYK, and they should always be tagged with a color space. TIFF files delivered to a printer should be accompanied by a guide print. Remember that the printer does not have the advantage of having a transparency for reference. The Guide Print should come from a profiled printer, and should be printed using the CMYK file, or from the CMYK proof color space to mimic the offset press.

TIFF files can be delivered via the Internet using FTP (file transfer protocol). Files delivered his way can be zipped or stuffed depending on the receiver's platform. These files will not have the benefit of a guide print, however, so the state of the receiver's color management needs to be determined.

The other file type that is standard is the JPEG (Joint Photographic Experts Group) file. This format provides the most dramatic means of file compression, which is why it is a standard Web file type. This file compression, however, comes at a price. The higher the level of compression, the more 'lossy' or subject to image degradation the file becomes.

An 18 MB file can be compressed to around 1 MB with very little loss of quality, however compressing it much more than that will start to create jpeg artifacts. Also, opening a JPEG, making any changes to it, and then resaving it as a JPEG will result in file degradation. Therefore, JPEG files can be used to good effect as long as you don't go too far with the compression, and plan to convert them back to TIFF files before doing any retouching or color correction.

Saving large TIFF files as high quality JPEGs is a reasonable storage strategy as long as these rules are respected. As with TIFF files, JPEGs should be tagged with a color space.

One other file format bears mentioning, and that is the PDF (Portable Document File) file format. PDF files are excellent for showing layouts to someone by e-mail, or for showing photos to someone who doesn't have a copy of Photoshop on their computer. Almost all computers sold today have a copy of Adobe Acrobat installed. PDF files are small (easy to e-mail), and can reproduce documents created in Quark, InDesign, Illustrator, as well as Photoshop. A PDF sent by e-mail and printed out on a profiled printer gives the recipient a color correct hard copy of a layout.

Other file types such as EPS and Photoshop® files have good attributes as well and can be used say between a photographer and designer, or photographer and offset printer just as long as both parties agree to the particular file format. If you don't know where the file is going, then TIFF or JPEG should be used.

File storage: Digital photo files take up lots of hard drive space. Digital photography could not take off until hard drive capacity got really large. 10 years ago, a 1 GB hard drive was almost unheard of. Now 120 GB drives are routine, and the match book size compact flash cards used by digital cameras are available in 256 MB, 512 MB, even 1 GB sizes. Sizes up to 6 GBs are under development.

Graphic designers running Quark on old Power PC's will find their systems brought to their knees trying to open the average digital camera file. Optical storage media such as CDR and DVD are probably the safest media for long-term storage. External hard drives are the fastest and most convenient but not necessarily the safest. A combination of the two methods is probably best at this time.

The client needs to develop a strategy for storing and accessing digital files. Is the Photographer going to do it, or is the client going to be responsible for it? Unless specifically spelled out in a contract, the photographer is not necessarily archiving clients' digital files.

In order to realize one of the major advantages of digital, namely exact duplicate searchable files, someone needs to create, store, and manage this resource. Probably the quickest and easiest storage method at this time is to archive all digital files on CDR or DVD, label the jewel case spines, and stored in some kind of order in a specially designed shelf unit. A more flexible system is a set of external hard drives containing a catalog to all the digital files contained on that drive.

Digital files contain so-called "EXIF" data, which can be used to sort and find specific files. It is probably an excellent idea for the client to develop a set of "file info" standards to be used by all contributing photographers.

There are programs available such as PhotoMechanic (Mac) or Digital Pro (Windows), which will insert into every photo file a complete dossier of information. At the very least, that information should include the date and time of the shoot, the location and project, a description or caption of the picture, the photographer, the copyright information, and any other keywords or categories that can be used by a search engine to locate a specific shot on a computer disc.

For convenience, it might be a good idea to standardize the file renaming protocol. Digital cameras automatically name every file, but those file names are not particularly informative. Programs such as PhotoMechanic or i-View Media Pro allow you to rename files in a more descriptive way- such as GlenelgSports 001.jpg- for instance.

Once the file information and naming parameters have been agreed to, the resulting database practically builds itself. This can be a huge advantage in choosing which pictures should be used for various advertising, brochure, annual report and web projects.

Conclusion: Although hardly exhaustive, I hope the points I have made help make the advantages and challenges of the digital photography revolution a little more clear. I hope that others involved in this creative process will weigh in with information that I have missed or failed to make understandable. I am confident that two things are true, this revolution is here to stay, and everything will get better and easier as time goes on.

References: Fraser, Murphy, Bunting *Real World Color Management*, Blatner, Fraser *Real World Photoshop 6*, Martin *Evening Adobe Photoshop 7 For Photographers*, Dan Margulis *Professional Photoshop 6*. Web-site references: <http://www.luminous-landscape.com/>
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