



Image Receiver Guidelines **Table of Contents**

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Advertising and Illustrative Photographers Association ([AIPA](#))
Australian Institute of Professional Photography ([AIPP](#))
American Society of Media Photographers ([ASMP](#))
American Society of Picture Professionals ([ASPP](#))
Associação Brasileira dos Fotógrafos de Publicidade ([ABRAFOTO](#))
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Foreword

Vision Statement: The photography industry is undergoing great change. New ways of making and working with photographs are replacing older methods. The broad capabilities and efficiencies of digital capture and delivery have revolutionized the image marketplace. But in doing so they have exposed gaps in creative and quality control that frequently lead to confusion, inefficiencies, loss of quality and unnecessary expense. We recognize the need for worldwide imaging standards to facilitate reliable and repeatable image reproduction.

Film-based photography workflows relied on transparencies or prints to establish and share color and tonal information. Digital imaging lacks such tangible references. Integrated color management with accepted ICC workflows fills that void. After more than a decade of regular use and adjustment, ICC (also known as ICM) has proved itself a mature technology used by thousands of professionals. As the first link in the image supply chain, photographers must establish and adhere to the best practices of color management. And those who work with their photographs must follow the same standards in order to accurately reproduce those photographs.

The media for delivery and storage of images have also changed. Digital Asset Management offers a set of standards to replace film-based workflows. Our task is to identify terminology and workflow for image creation, image delivery, accurate reproduction and archiving. Implementing the standards and practices in these guidelines will enhance creative control and economic efficiency.

Mission Statement: The UPDIG Coalition is a global initiative of industry organizations working to identify, define and share best technical practices for reproducing, exchanging and archiving digital images.

The UPDIG Coalition brings together industry experts representing creators, distributors, users, technology providers and others dedicated to this mission.

The UPDIG Coalition collectively publishes and promotes the *Universal Photographic Digital Imaging Guidelines*.

Objectives:

1. Make digital imaging practices clearer and more reliable by developing standards for quality and terminology.
2. Develop web resources for imaging professionals that establish common digital imaging terms.
3. Demonstrate the creative and economic benefits of these guidelines.
4. Develop industry guidelines and suggested workflows for various types of image reproduction.
5. Establish consensus on these issues among professional photography trade organizations, image distributors, archives, printers, software developers and manufacturers.

Standardization Goals:

1. Color Management: ICC Workflow, Hardware Calibration, Guide Prints and Proofs
2. File Delivery and Archiving: Naming Conventions, Resolution, Sharpening, Digital Workflow
3. Metadata: embedded IPTC and XMP data, including PLUS Licensing Language
4. Industry Terminology

About the Guidelines for Image Receivers

The purpose of this document is to help you create Submission Guidelines that effectively communicate your requirements to your image suppliers.

The Goal

The UPDIG Image Receiver Guidelines recommend standards to improve the “hand-off” of digital image files from photographers to end users of all types. This diverse community includes stock image distributors, magazine and book publishers, publication designers, web designers, art directors, museums, printers, fine-art publishers and more.

UPDIG’s Digital Imaging Submissions Guidelines working group reviewed the submission practices of various end-user communities, identified best practices and standards that meet their needs, and produced this document to help users develop their own Submission Guidelines.

Members of the DISG working group represent both digital image suppliers and user communities, including magazine publishers, stock image distributors, graphic and web designers, museums, and others.

The Problem

While end users usually have specific criteria for image submission, they often lack clear, consistent terminology for communicating those guidelines. As a result, photographers submit digital images in a variety of image formats, with various resolutions, camera types, color profiles, metadata schemas, sharpening and tonal correction.

That is a problem, not just for the end users, but also for the photographers. It inhibits creativity and results in inefficiencies for all who work with digital images.

Recommendation

All digital image users should consistently present a Submission Guidelines “checklist” when requesting digital image files. Base such checklists on best practices outlined in the UPDIG Universal Digital Imaging Guidelines and summarized in this report.

Image Receivers Quick Guide

Before developing your Submissions Guidelines, carefully evaluate your needs and decide on a consistent policy for instructing photographers how to prepare digital files.

The following are key elements to address. After choosing the options that fit your business, you can use our [Guideline Generator](#) to prepare a document that contains your own custom Digital Image Submission Guidelines.

Main Principles

- Digital images should look the same as they transfer between devices, platforms and vendors.
- Digital images should be prepared in the correct resolution, size and sharpness for the device(s) on which they will be viewed or printed.
- Digital images should have embedded metadata that conform to the [IPTC](#) and [PLUS](#) standards, making them searchable while providing relevant rights and usage information – including creator’s name, contact information and a description of licensed uses.
- Digital images should be protected from accidental erasure or corruption and stored carefully to ensure their availability to future generations.

1. Color Management

Both suppliers and receivers of a digital image file need to see the same image. This requires setting systems to display standardized, consistent color, and embedding in images color profiles that describe their color characteristics.

2. File Size and Resolution

File size depends on intended use. As a rule, **stock image distributors** require the largest file sizes, since final use is unknown. **Magazines** can be more specific, although they may request Double Page (11 x 17 inches, A3 or 420mm x 297mm) for maximum flexibility in placement and cropping. **Graphic designers** and advertising art directors should be very specific about file sizes, since it’s best for the photographer to deliver files within 10 percent of final size – unless the designer will handle resizing and output sharpening. Designers who do resize images should start with a larger size and reduce it, rather than attempting to increase the resolution of smaller image files. **Web** use and digital projection require much smaller file sizes. Widescreen **HDTV** requires 1920 x 1080 pixels for uncropped images.

3. File Delivery Formats

TIFF and JPEG (quality 10 or higher in the Photoshop “Save As” dialog) are usually the preferred file formats for delivery. Be aware that JPEGs saved at anything less than level 12 quality may have compression artifacts that could show up under certain printing conditions, such as the use of stochastic screens. Both are standard formats, universally supported by image-editing and image-cataloging software. And both can safely hold metadata. Be careful about requesting or submitting raw file formats, including DNG files. While they allow a wide range of adjustments, this can lead to final color and tone that differ considerably from what the photographer intended – or the client expects. [complete guideline](#)

4. File Delivery Options

Regardless of format, file extensions are essential. If receiving images on CD-R or DVD-R discs, request them recorded in ISO 9660, cross-platform format. A portable hard drive may be the best tool for delivering large numbers of files, but beware of compatibility issues between Macintosh and Windows file systems. Online delivery via email, FTP or a commercial web delivery service offers an increasingly attractive and viable option. Compressing folders of files in digital wrappers, such as ZIP or SIT archives, helps avoid file corruption. UPDIG recommends requesting “ReadMe” files on all delivery media, listing file characteristics, any special concerns and usage rights. [complete guideline](#)

5. ICC Profiles

There are two primary color modes in use : RGB and CMYK. RGB (Red, Green, Blue) is the standard archival and delivery color space, and holds more color information than CMYK (Cyan, Magenta, Yellow, Black) which is used for print output.

The conversion of an RGB file to CMYK involves a loss of color information that is not reversible, so in general it is best to retain images in RGB as far as possible in the workflow. CMYK’s image files with four channels are 25 percent larger than the equivalent RGB with three channels. Adobe RGB (1998) is the most common delivery standard, with ECI RGB being adopted by some publishers in Europe. Unfortunately, the sRGB color space is probably used more often than either, although its smaller color gamut clips some colors that fall within the gamut of an offset press rendering those otherwise printable colors un-printable.

Color profiles specify which color space the image is in, and should always be embedded in the image when saving, and preserved when opening, for correct viewing and handling. It is impossible to interpret the color numbers in an image correctly and with certainty if the color space is not known. [complete guideline](#)

6. Sharpening

After resolution and color, sharpening can have the most impact on perceived image quality. Most digital cameras deliver slightly soft images (unless the capture format is set to JPEG or TIFF with in-camera sharpening turned up). This results from the almost universal use of anti-aliasing filters to combat moiré. Scanning camera backs and some medium-format backs –

especially those with multi-shot mode may not have this feature. If we assume single-shot raw file capture, it is entirely appropriate to request a small amount of default “capture” sharpening. Without it, digital image files may look too soft.

How and when to add process sharpening and sharpening for output requires clear communication between those requesting digital files, and those creating and delivering digital image files.

7. File Quality

All images, whether originating from scanner or from digital camera files, need to be processed, but unskilled processing and correction, as well as over-sharpening and over-compression, lead to degradation of image quality. High quality scanners should be used, but image quality will depend as much on *scanning and image processing skills* as on the technology employed.

Image submissions guidelines are always important, and photographers should work to generally accepted standards if their customer does not supply their own guidelines (link to Digital Image Spec) along with proper quality control. Guides to common image faults may also be useful for suppliers.

8. File Naming

To avoid problems with files transferred across computing platforms, request file names that use only the letters of the Latin alphabet (A-Z, a-z), the numerals 0 through 9, hyphens and underscores. Avoid other punctuation marks, accented vowels, non-Latin letters or other non-standard characters, such as \:/*<> or brackets. On a local network or with rewritable media, limit the file name to 31 characters or less (including the three-letter file extension. Limit file names to 11 characters or less (including the three-letter file extension) when burning to optical media, since some computers may not support long file names. Use a single period (“.”) between the file name and extension. Specify unique file names. Multiple files with the same name will cause problems for computers and people alike, and a newer file might automatically overwrite an older with the same name, or vice-versa. You may want to specify including the numeric date and/or the name of the photographer as part of the file name as a way to avoid duplicate names.

For a complete guide to file-naming protocol, see the [Controlled Vocabulary website](#).

Stock image distributors have the greatest need to implement their own file naming conventions, followed by magazines and publishers.

For image-file tracking, it’s a good idea to ask image creators to include their original file names in Document Title fields (of images’ metadata), since many end users change the names associated with files.

9. Metadata

Digital image metadata is information about the image. Information like picture number, caption, credit and copyright that used to be carried on the hard copy, should now be found within the digital file so that images are captioned and can be traced back to their supplier and copyright holder.

Metadata come in many forms and schemas, from EXIF, to ICC profiles, IPTC, XMP and PLUS. Metadata needs vary for stock image distributors, magazines, publishers, print and web designers, and photographers maintaining their own libraries. When requesting or delivering digital image files, understand and use metadata to streamline the production workflow. It's increasingly common for stock-image distributors and magazine publishers to develop custom XMP metadata panels that conform to their particular needs. [complete guideline](#)

10. Fine Art Reproduction

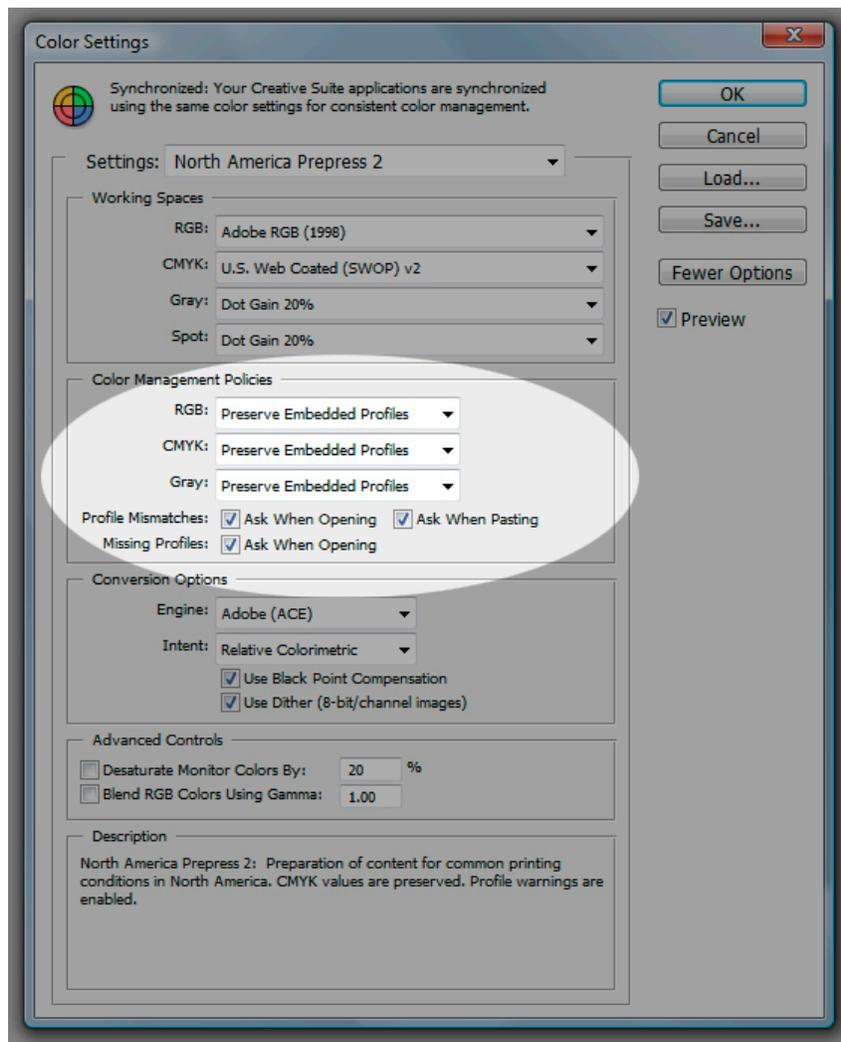
Creating and preparing digital reproductions of fine artworks requires all the careful attention to details already presented, but it also poses significant additional challenges. Unlike typical photo reproduction, the colors within digital files of artwork are not subject to interpretation or individual preference. The reproduction must produce the same perceived color (within physical limitations) as the original artwork. [complete guideline](#)

IMAGE RECEIVERS GUIDELINES

1. Getting on the Same Page with Color

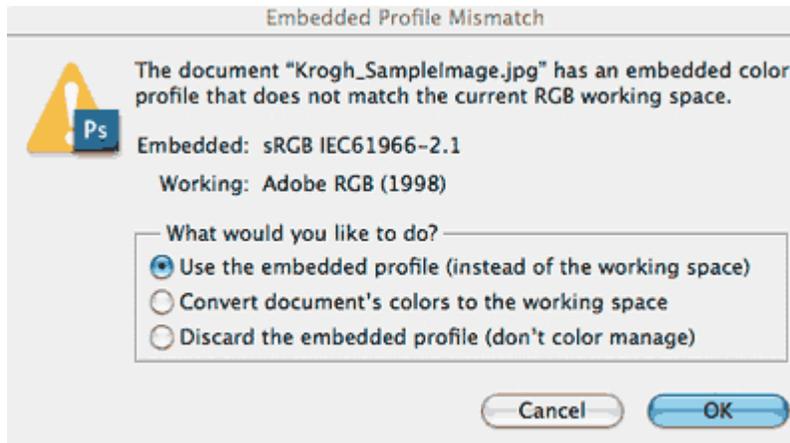
Both suppliers and receivers of a digital image file need to see the same picture on their monitors. This requires setting up systems to display standardized consistent color in a way, and using color profiles in images to describe their color characteristics. The first step is to set computers and monitors to display accurate color.

How to set up your system to display correct color:



Step 1. Configure Adobe Photoshop’s “Color Settings” to *Preserve Embedded Profiles*. In addition, check the boxes that will cause Photoshop to warn of profile mismatches or missing profiles when opening or pasting files.

If Photoshop presents the Embedded Profile Mismatch warning, choose *Use the embedded profile*.



Step 2. Calibrate and profile your monitor.

Calibrate and profile monitors with a hardware device. Visual calibration is inadequate for professional image editing. Accurate visual representation of the image file is extremely important to the imaging process. Calibration standards range from:

Gamma — 1.8 to 2.2 (or L*).

White point — 5000K to 6500K.

Brightness levels — 80cd/m² to 140 cd/m².

As a general calibration guideline for both Windows and Macintosh systems, use gamma 2.2 and choose an appropriate color temperature between 5000K and 6500K. If preparing files for offset printing, you will find most printers and prepress professionals use 5000K to 5500K. When preparing files for the web, 6500K is probably the best choice, since most consumer-grade monitors are set to higher color temperatures. Choose an appropriate monitor brightness level according to the room's ambient lighting before beginning your calibration.

Paired with accurate, embedded color profiles, a calibrated and profiled monitor allows you to “soft-proof” the intended output in Adobe Photoshop. A daylight (D50) light source at correct brightness helps visually match monitor to print. To achieve correct brightness, lower the luminance of the light source (viewing booth) to match the luminance of the monitor.

2. Getting on the Same Page with File Size and Resolution

File Dimensions

File size needs depend on intended uses. As a rule, **stock image distributors** require the largest file sizes, since final usage is unknown. **Magazines** can be more specific, although they may request Double Page (11 x 17 inches, A3 or 420mm x 297mm) for maximum flexibility in placement and cropping. **Graphic designers** and advertising art directors should be very specific about file sizes, since it's best for the photographer to deliver files within 10 percent of final size – unless the designer will handle resizing and output sharpening. Designers who do resize images should start with a larger size and reduce it, rather than attempting to increase the resolution of smaller image files. **Web** use and digital projection require much smaller file sizes, measured in pixels, and usually saved at screen resolution of 72 ppi. Widescreen **HDTV** requires a minimum of 1920 x 1080 pixels for uncropped images, though producers often ask for larger files to allow for panning and zooming.

Uncompressed file size requirements for print	
	RGB TIFF at 300 ppi (default for 150-line screen)
Double page (A3)	50 MB
Full page (A4)	25 MB
Half page (A5)	12 MB
Quarter page	6 MB
Eighth page	3 MB
Billboard	48 MB at 600 ppi (but 300 ppi is acceptable, <i>i.e.</i> 24 MB)

The current, uncompressed file-size standard for commercial stock images is 48 to 50 MB. A 50-MB file works for larger than A3 reproduction, because posters, banners, point-of-purchase displays and [billboards](#) print with coarser halftone screens, measured in lines per inch (lpi). As the final size for such uses gets larger, so does the intended viewing distance, obscuring coarse screen patterns. Hence, a 50 MB image file at 200 ppi, which is plenty of resolution for a 100-lpi halftone or color separation, can then fill a 17x22 sheet.

Note, too, that software RIPs driving wide-format printing devices have sophisticated algorithms that interpolate image files on the fly. If reproducing images at larger sizes than an image file's

pixel count allows, it is usually better to allow the RIP to resize large images – rather than using Photoshop, and then dealing with larger files during delivery, processing and storage.

Digital Capture Quality Parameters: Sensor Size and File Dimensions

Camera sensor size and file dimensions offer only a rough guide to final printed quality. Digital image files may be made larger or smaller by interpolation in imaging software, which adds or removes pixels. RIP software and hardware can also interpolate during printing. Careful interpolation can increase digital image files in size by as much as 400 percent. However, even with the best software and a skilled operator, success depends on the qualities of the original file and the final output required. Note that increasing resolution through interpolation does not add detail to a file. It may, however, prevent obvious pixelation for a smoother look.

Sensor size (megapixels)	Pixel Dimensions	Approx. Doc. Size at 300 ppi	Approx. 8-bit File Size
17.5 MP	3413 x 5120	11 x 17 inches	50 MB
11.2 MP	2731 x 4096	9 x 13 inches	32 MB
6.3 MP	2048 x 3072	7 x 10 inches	18 MB

Stock-image distributors, magazine publishers and others requesting files may specify a certain minimum size for camera sensors used to generate image files. However, pixel quality trumps pixel numbers, so a high-quality 6-MP sensor will often be sufficient for 95 percent of intended uses, while pictures from a 10-MP sensor in a point-and-shoot camera may not look good beyond 8x10 inches at 300 ppi, especially if used at an ISO exposure setting above 200. Although many publishers have standardized on 300 ppi for 150-line screens, the actual requirement is 1.3- to 2-times the halftone-screen resolution, so as a practical matter, smaller files can successfully work for a given final size.

3. Delivery File Formats

In most cases, the choice for delivered file formats is between uncompressed TIFF and JPEG (quality 8 or higher in the Photoshop “Save As” dialog). Both are standard formats, universally supported by image-editing and image-cataloging software. And both can safely hold metadata.

TIFF Files

TIFF has the advantage of higher quality due to the absence of compression artifacts, but JPEGs saved with low compression (Photoshop’s level 10 or better) will not have detectable artifacts.

TIFF files and low-compression JPEG files may be saved and resaved without image deterioration, but saving and re-saving a high-compression JPEG file will degrade image quality.

TIFF files can also have greater bit depth, which makes them better candidates for significant pixel-level editing, such as color and tone adjustment. However, a TIFF file is at least five times larger than even the least-compressed JPEG version of the same image, or 10 times larger in 16-bit mode. This means TIFF files will take up five to 10 times more storage space when archived or written to removable media for delivery. They will also require five to 10 times the bandwidth or transmission time to send electronically. TIFF files do have several compression options: LZW, ZIP, and JPEG. Since TIFF compression is not universally supported, it is important to communicate which compression method you intend to use with the receiver of the files. In general, once an image has image processing and correction by a skilled photographer or digital imaging specialist, there is little advantage to requesting or delivering 16-bit files unless the end user plans to make significant creative tonal or color edits to the image.

There is also a peculiarity with saving TIFF files: The option to save using PC byte order or Macintosh byte order. The TIFF specifications require all applications to read either byte order, so either option is correct.

JPEG Files

JPEG offers smaller sizes due to the format's sliding compression scale. But JPEG uses "lossy" compression algorithms that toss out some data. As the compression level increases, so does the amount of "lost" data, decreasing both image quality and file size. The trade-off is more compression artifacts with more compression in order to achieve smaller file sizes. Although Photoshop's JPEG quality level 8 is the minimum recommended value, a setting of 10 to 12 is preferred. Other programs have different compression scales, so test to determine the corresponding settings. For instance, Microsoft Expression Media (formerly iView Media Pro) offers a JPEG setting of "high" that is roughly equivalent to Photoshop's setting of 10.

Remember: Uncompressed TIFF files without generating any artifacts. JPEG files may be saved and resaved several times at level 12 without obvious image deterioration, but saving and re-saving a high-compression JPEG files will degrade image quality.

Other potential drawbacks to the JPEG format are its maximum 8-bit color depth, compared to TIFF's 16-bit limit. JPEG image files also cannot include layers or alpha channels.

For most people, most of the time, the JPEG format will be easier to work with than TIFF. With proper handling, a JPEG image at quality 12 would appear equal to a TIFF, except the latter can include a greater bit depth, layers and channels. Stock-image distributors can choose between JPEG and TIFF, depending on their client base and preferred method of delivery. Because stock distributors now focus on electronic delivery, JPEG files are likely the best choice. With sufficient infrastructure, stock distributors could maintain both formats: a TIFF original, and a method to make JPEG copies as needed.

TIFF and JPEG at a glance:

TIFF	Standard JPEG
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Uncompressed format (except TIFF compressed)	Compressed format
No compression artifacts	Compression artifacts not usually visible at Photoshop quality 10 and above. JPEGs saved at quality 12 are visually indistinguishable from TIFF.
Can be opened and saved without damage to the image	Re-compression takes place each time an image is resaved. Repeated saving of an image leads to deterioration
Can be 16 bit, so better for image editing	Only 8 bit. Editing will cause more damage to the image
Larger file. Use more storage space, but are standard for quality archiving.	Smaller file, Good for emailing, downloading, bulk storage of news images.
Can include layers and alpha channels	Files are 'flattened' and cannot include these.

Raw Files

When we speak of raw file delivery, we must carefully define terms. Some people consider as “raw” an unretouched or “out-of-camera” TIFF file. Actual raw files may be of two varieties: proprietary raw (such as .CR2, .NEF, .FFF and more than 100 others) or Adobe’s DNG format. As a general principle, you should neither request nor deliver proprietary raw files. **Proprietary raw** files are by their very nature unprocessed. They may not convey the color, tone or other visual information the photographer intended to share. One imperfect solution would be including a Macbeth color checker or similar tool in every frame, or in a reference image created with the same lighting. Another way, also imperfect, would be for the photographer to adjust the color in raw-file processing software, and then specify the receiver use an identical version of the software to open the files. The photographer would need to carefully include reference data, such as XMP “sidecar” files from Adobe Camera Raw or the cached color settings folder from Phase One Capture One. Even when following these procedures, people requesting proprietary raw files need to understand they are, in effect, preventing the photographer from creating a finished product. There is also a risk of losing metadata, since in many cases, custom metadata identifying the creator, copyright information, status and usage terms is not embedded in a proprietary raw file, but is attached as a sidecar (usually XMP) file. A potential compromise might be requesting proprietary raw files AND TIFF or JPEG files processed by the photographer, offering a comparison to insure against inaccurate raw conversion.

DNG FILES

Some standards bodies (DISC, for instance) list DNG as a possible delivery file format. Since DNG images are in a raw file format, they are also subject to interpretation. However, a DNG file does contain processing information, along with metadata and a rendered JPEG file. The rendered JPEG offers a visual representation of the photographer’s processing. This JPEG can be viewed in Adobe Bridge, Photoshop or most cataloging software, such as Microsoft Expression Media. While DNG is a better delivery option than proprietary raw, it stills gives the receiver wide latitude to interpret the image. This can be a double-edged sword – good if the photographer has poor technique, and bad if the photographer has a processing style or finished look that is overridden by the end user.

JPEG 2000 (.jp2, .jpx, .jpf)

Created by the [Joint Photographic Experts Group](#) committee in 2000, [JPEG2000](#) is a [wavelet-based, image-compression](#) standard. JPEG2000 offers a compression performance gain of around 20 percent compared to the standard JPEG. For lower or higher compression rates, the improvement can be somewhat greater. It has, however, notably higher computational and memory demands, which for most photographers means opening and closing JPEG2000 files takes more time. Unlike the standard, baseline JPEG, JPEG2000 does offer a fully lossless option. Improved compression options and performance, however, are not the main benefit of JPEG2000. The real achievement of JPEG2000 is “smart decoding.” This feature enables a decoding application (or plug-in) to access and decode only the required portion of the code stream. This means a single JPEG2000 image can supply multiple, reduced-resolution versions of the original. These might include specific file sizes, and/or a high-quality, high-resolution view of a specific portion of the image. This makes JPEG2000 an excellent format if you require the ability to smoothly zoom, pan and rotate images. Creating compressed images that contain different quality levels allows master images in an archive to supply multiple derivatives, saving time and bandwidth. This makes an image archive much more efficient. In addition to this array of output options, JPEG2000 can handle very large images, at least up to a terabyte. JPEG2000, unlike standard, baseline JPEG, supports high-bit-depth (up to 16 bits per channel vs. 8 for standard JPEG) and high-dynamic-range images. JPEG2000 also underpins the MJ2 and JPM formats for motion images (each frame is a JPEG2000-compressed image) and compound images (images, graphics and text). These additional features make the JPEG2000 format a potentially valuable option for archiving film, video and historical materials.

JPEG2000 has not been widely adopted by photographers. Raw and DNG are viewed as better solutions for their specific needs. And JPEG2000 is not a good candidate to replace standard JPEG as a digital capture format, since the former requires far greater compression time. Still, photographers may want to become more familiar with JPEG2000 and be prepared to deliver in one of its variants, since many cultural heritage and digital preservation communities use it as the basis for their collections. Unlike photographers, these institutions are less concerned with improved rendering options over time. Their focus is preserving a specific rendering intent in the best way possible, with the most efficient storage and delivery options. JPEG2000 does these things well. The unanswered question is whether this “niche” adoption of JPEG2000 will ensure its long-term viability as an archival format. Some of the cultural institutions finding JPEG2000 to be the best current solution for their archiving needs include The Library of Congress, the Harvard University Library, Library and Archives Canada, Chronicling America website and the Google Library Project. For more information, see the [Digital Preservation Coalition Technology Watch Report](#).

HD Photo (JPEG XR)

Although this may become an important format in the future, especially if the JPEG Committee approves this as an additional JPEG standard, lack of native support in Photoshop CS3 means that requesting files in this format would be problematic. Originally called Windows Media Photo, then renamed HD Photo, Microsoft is now working with the Joint Photographic Experts Group to make the format a JPEG standard, JPEG XR (for extended dynamic range). HD Photo has shown no compelling advantages over JPEG2000 for archival purposes. But HD Photo does have a faster compression algorithm compared to standard JPEG, and this offers some potential advantages as a digital capture format. Since the main drawbacks to the standard JPEG format are the 8-bit tonal depth limit and limited dynamic range, JPEG XR could provide a welcome step. Covered by Microsoft’s [Open Specification Promise](#), JPEG XR avoids problems associated with proprietary raw formats. The future of JPEG XR depends on camera makers offering it as a

capture format. If and when this happens, then JPEG XR would become a potential archival format as well.

HD Photo is also the basis for the Microsoft [Seadragon](#) project and the related [Photosynth](#) photo viewing technology. These new technologies could also drive the adoption of HD Photo, since they both use HD Photo's ability to decode only the needed portions of an image, allowing for rapid screen draws as images are combined, zoomed, and panned. The latest Windows operating systems include full support for HD Photo. Updated version of HD Photo Plug-ins are available from Bill Crow's HD Photo Blog <http://blogs.msdn.com/billcrow/archive/2007/08/17/updated-hd-photo-plug-ins-for-adobe-photoshop-software.aspx> Although OS X doesn't currently support HD Photo as a native format, it is supported through installing the HD Photo Plug-ins for Adobe Photoshop CS2 and CS3. Whenever Photoshop writes an HD Photo file, it also creates a thumbnail on the resource fork in a compatible format for OS X. The result is that thumbnails are created that show in the OS X finder.

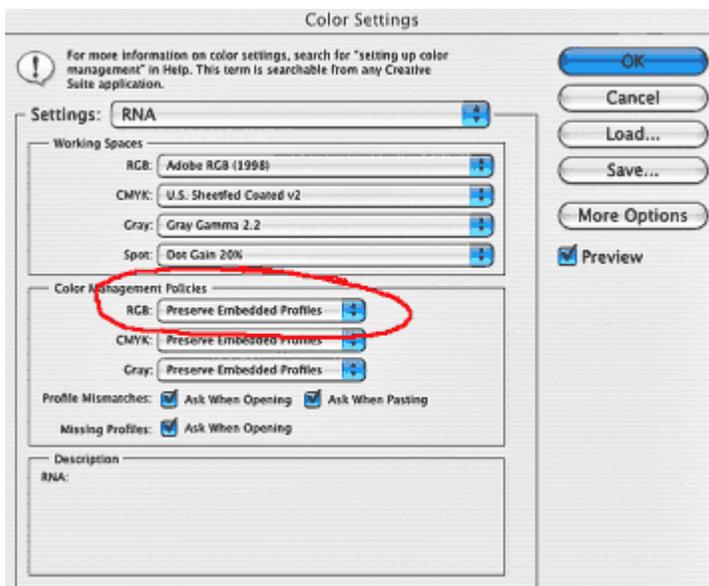
4. File Delivery Options

File extensions. Regardless of file format, always add file extensions, especially for cross-platform transmission or delivery. (Multiple extensions such as “.CR2.TIF” can sometimes confuse both systems and operators. Use only a single, correct extension for the file type.)

ReadMe files. UPDIG recommends including ReadMe files on all delivered media and with transmitted image files. The ReadMe should list and describe all delivered files, their characteristics and usage rights. ReadMe files must be specific. Here is a sample ReadMe file for digital image files delivered to a graphic designer for use in an annual report:

ABOUT THESE DIGITAL IMAGE FILES: These files are copyright XYZ.

RIGHTS GRANTED: One-time, exclusive use by The ABC Company for its 2008 annual report. All rights are reserved except those specifically granted by the invoice.



These files are optimized for print applications. They are in Adobe RGB(1998) color space. For accurate color, preserve the embedded profile when opening.

These files have been sharpened for output. If they are reduced in size by more than 20 percent, they may need to be sharpened slightly.

For more information about digital file handling: <http://www.UPDIG.org>.

Cross-rendered **CMYK guide prints** can offer a very general reference point for digital image files. But photographers who include CMYK guide prints with their digital files must profile their printers. This is particularly true with CMYK files submitted to offset printers. Unless using a professional proofing system, photographers should include disclaimers stating guide prints are for color reference only and are not “verifiable” proofs such as contract proofs. Contract proofs can only be supplied by the offset printer hired to produce the job.

Provision of CMYK guide prints cannot be a key requirement in the stock industry or in many areas of the publishing industry. The numbers of images are too great and/or file delivery is increasingly done electronically. CMYK Guide prints may be requested for color critical work. However even in this area, soft proofing of the delivered files is becoming the norm. In many cases, instead of relying on guide prints, photographers should routinely soft proof in the output color space.

Since inkjet prints made from RGB editing spaces may have wider color gamuts than available from an offset press, a CMYK guide print will more accurately reflect what is possible to achieve on an offset press if the print is “cross rendered.” Cross rendering involves printing from your current output color space through an intermediate output color space to simulate the appearance of the final output space. For example, in the print dialogue, the “source” space would be either the CMYK file or the CMYK proof space. Choosing Relative Colorimetric as the rendering intent will limit a desktop printer’s color to the gamut of the CMYK file. If you use Absolute Colorimetric (or check the “simulate paper color” box in Photoshop CS2 or CS3), you may more closely simulate the actual press sheet, since the whites will more closely match the duller white of the actual press stock.

For more detailed information about creating cross-rendered guide prints, see the UPDIG Image Creators Guideline for [CMYK Guide Prints and Verifiable Proofs](#).

CD-R or DVD-R delivery requires recording in ISO 9660 cross-platform format. It is helpful to use inkjet-writable media or [LightScribe](#) media, on which certain optical disc burners can produce laser-etched labels. Do not accept or send media with adhesive labels, since they may separate from the disc and damage optical drives.

Hard drives can be the most efficient media for delivering large or large numbers of files. If you request hard-drive delivery, note compatibility issues between the Macintosh and Windows file systems. Since Macs have common USB ports and can read and write to Windows-formatted media, it’s best to use an external USB or USB 2.0 hard drive, initialized with the standard “Windows [FAT](#)” format. Note the FAT system limits individual file sizes to four gigabytes. Another way to avoid compatibility issues is to use network drives over a local area network, which is increasingly practical as common network speeds increase.

Electronic delivery

Electronic delivery is increasingly attractive and viable. Digital wrappers, such as ZIP and SIT archives, can simplify transmitting multiple files, incorporate a delivery ReadMe file and be secured with a password. The “Compress” function in Macintosh OS X 10.5.x (“Create Archive of” in OS X 10.4 and 10.3) will append a period and the ZIP extension to the resulting, compressed file or folder. For example, a folder called “Images” becomes the archive “Images.zip.” Note, however, if you choose a single file with an existing extension, Mac’s “Compress” will create an archive file name with two periods and two extensions. For example, “image1.tif will become “image1.tif.zip.” Mac systems have no problem with the double extension, but web servers aren’t always so tolerant. Because of security concerns, many ISP’s will automatically delete or quarantine such files.

Electronic Delivery Methods

Internet Download. Web file delivery is convenient. The file can be transferred onto a web server system by browser upload, FTP or other transfer method. The person delivering the file will require the specific address and path of the delivery directory on the receiving web server, as well as any needed login information.

Email Attachment. So long as the file being transferred is not too large, email attachment can be a dependable way to receive an image file. Attachments as large as 1 or 2 megabytes work reliably with most services. Some email services will accept huge attachments, but most do not. Check before requesting large files. Note that with the huge volume of email coursing through the Internet at any given moment, valuable files are hard for a thief to discern, so reasonably sized files are relatively secure when sent as email attachments.

Supplier and client must both have access to email services and email software. But many email service providers offer a web browser interface to email accounts, usually without security. Most browser-based web email services include file upload capabilities, but more than a few still do not.

5. ICC Profiles

File Delivery Color Profile Options

There are two primary color modes in use : RGB and CMYK. RGB (Red, Green, Blue) is the standard archival and delivery color space, and holds more color information than CMYK (Cyan, Magenta, Yellow, Black) which is used for print output.

The conversion of an RGB file to CMYK involves a loss of color information that is not reversible, so in general it is best to retain images in RGB as far as possible in the workflow. CMYK’s image files with 4 channels are 25 percent larger than the equivalent RGB with 3 channels. Adobe RGB (1998) is the most common delivery standard, with ECI RGB being adopted by some publishers in Europe. Unfortunately, the sRGB color space is probably used more often than either, although its smaller color gamut clips some colors that fall within the gamut of an offset press rendering those otherwise printable colors un-printable.

Color profiles specify which color space the image is in, and should always be attached to the image when saving, and preserved when opening, for correct viewing and handling. It is impossible to interpret the color numbers in an image correctly and with certainty if the color space is not known.

RGB or CMYK for File Delivery?

The two color modes offer a choice of RGB or CMYK file delivery by photographers. Which is best depends on a number of factors:

- a) General publishing or high-end advertising/printing.
- b) The skill and pre-press knowledge of the photographer.
- c) Whether the printer/press/press profile is known in advance.
- d) Whether the photographer is delivering a final finished image, or whether there will be other color edits or retouching that will be done to the image by a graphic designer, retouch artist or other.
- e) The skill and pre-press knowledge of the graphic designer and/or the printer.
- f) The likelihood that embedded RGB profiles will be honored.

In general, the industry trend is for most photographers to deliver RGB files, and for graphic designers to convert them to CMYK, except for cases where the printer makes the conversion. Many high-end photographers prefer to deliver CMYK files, particularly those who handle retouching or other special processes in the workflow. This requires good communication and buy-in by the client/designer/printer so that the photographer has all the required information. Knowing the exact press profile is not always necessary as many printers use [device link profiles](#) to optimize CMYK files to their specific press conditions. The advantage of device link profiles over CMYK-CMYK conversions using Photoshop, is that the black (K) channel is preserved. CMYK delivery has sometimes been referred to as an “early binding” workflow. The main advantage of early binding workflow is simplicity, and less reliance that others down the workflow chain will do something wrong (strip or ignore and embedded RGB profile), or not do something (forget to sharpen image files for output after resizing).

RGB delivery, and maintaining the files in RGB until just before inclusion in the page layout/.PDF/or even by means of the platesetter’s or imagesetter’s RIP is referred to as “late binding” workflow. The advantage of this workflow is flexibility. Image files can be worked on by people down the workflow, and the image files can be easily repurposed for different types of print output, or even used for display or web use. The caveat is that everyone in the workflow needs to understand and use color management and correct file handling and output sharpening. Another potential disadvantage- but one many clients have some familiarity with- is that the quality of the final output is not known until you are at the proof, or even the press stage. With that as an introduction, here is a chart showing the main differences between the two workflows, followed by information about the RGB workflow, followed by information about the CMYK workflow.

RGB	CMYK
Image will pass through a number of hands on its way to output.	Shorter supply chain to design, or print
Image for repurposing – print, web, presentation etc.	Use in print only
The default for general publishing use.	An option in controlled high-end colour critical situations
Always use when the image is to be archived for further use	Not suitable for archiving
Larger gamut than CMYK for most colors	Color range restricted for print output.
Smaller file size than CMYK – 3 channels, R,G, and B.	Larger file size due to 4 channels, C,M,Y and K.

The RGB workflow:

The most commonly used RGB profiles include:

- sRGB, a narrow-gamut but common space.
- Adobe RGB (1998), a wider-gamut color space.
- ECI-RGB, a color space increasingly popular in Europe.

Adobe RGB (1998) and ECI-RGB come much closer than sRGB to encompassing the color gamut of standard CMYK profiles. Those involved in high-end, fine-art inkjet printing often use ProPhoto RGB, which has an even wider gamut. But the wider gamut leaves more room for error, making it problematic for standard delivery. Note, too, that proper display of colors in Adobe RGB (1998) files requires calibrated monitors and users who preserve embedded profiles. Under ideal circumstances, it's best to work with the Adobe RGB (1998) or ECI color space, but the additional color gamut can become a liability if the printer strips out or ignores the embedded profile, resulting in flat and toneless images. Despite these problems, it is important to communicate that the default setting in Europe and US Pre-press defaults in Photoshop is currently Adobe RGB (1998). Everyone in the workflow should be encouraged to implement color-managed workflows for best results.

General principles for RGB file delivery:

- If no submission guidelines are provided, the standard submission format is Adobe RGB for print or general use, and sRGB for web only use.
- Photographers should always embed the RGB profile.
- Photographers state clearly what they are providing in the read-me file.
- Receivers of RGB files should always preserve embedded RGB profiles when opening files.
- If the client asks for sRGB for print, then that is what the photographer has to provide. The results are the responsibility of the client.

For web and digital projection, sRGB is the clear choice. The web is a lowest common denominator medium, where you must assume monitors are not calibrated and web browsers are unable to read color profile tags.

For more information about web browser color management, visit these web pages:

http://www.northlight-images.co.uk/article_pages/web-browser-color-management.html*
<http://regex.info/blog/photo-tech/color-spaces-page2/>*

The CMYK Workflow:

The most commonly used CMYK profiles include:

- US Web Coated (SWOP) v2, ships with Photoshop as the North American Prepress 2 default.
- Coated FOGRA27 (ISO 12647-2-2004), ships with Photoshop as the Europe Prepress 2 default
- Japan Color 2001 Coated, the Japan Prepress 2 default.

- Many printers in the US are starting to use the [G7](#) methodology and [GRACoL](#) CMYK profiles for their sheetfed presses. These new CMYK profiles will likely ship in the new versions of Photoshop.

Although the industry trend is for the RGB workflow to extend further towards the print output, the vast majority of small- to medium-size offset printers still prefer receiving CMYK files, even if they often can't specify exactly which CMYK profile they need. As result, many graphic designers use Photoshop's *Image>Mode>CMYK* to convert RGB files to CMYK. By doing so, they convert to the default CMYK profile in Photoshop's Color Settings. The initial default setting is U.S. Web Coated (SWOP) v2, or Coated FOGRA27 in Europe, even though these may not be optimal profiles. Graphic designers need to assess the choice of CMYK delivery based on the capabilities (or lack of them) of the photographer or the printer to convert files. In some high-end situations, the photographer may be skilled at CMYK conversion and will achieve better results than the designer. In these instances, the photographer will need access to the printer settings. Our testing and other anecdotal evidence leads us to believe that U.S. Web Coated (SWOP) v2 in the U.S. at least, is much preferred over the U.S. Sheetfed v2 profiles even for sheetfed presses. This is because most printers have standardized on the SWOP profile and not the Sheetfed profile. Printers that have gone over to [G7/GRACoL](#) printing are finding that while the GRACoL profiles are optimal, the SWOP profiles still work quite well, which was an intended result of the G7 method. One additional, but little known fact is that many printers routinely re-separate CMYK files to better match their press conditions, or even to save ink by trimming total ink coverage and/or increasing [GCR](#) (grey component replacement). Some printers use Photoshop to do this, which while not optimal, works, while others use [device link profiles](#), a better method.

6. Sharpening

After resolution and color, sharpening can have the most impact on perceived image quality. Most digital cameras deliver slightly soft images (unless the capture format is set to JPEG or TIFF with in-camera sharpening turned up). This results from the almost universal use of anti-aliasing filters to combat moiré patterns. Scanning camera backs do not need AA filters. Some medium-format backs – especially those with multi-shot mode – also may not have an AA filter. If we assume single-shot raw file capture, it is entirely appropriate to request a small amount of default “capture” sharpening. Without it, digital image files may look too soft.

Stock image distributors often request “unsharpened” digital files. It might be better to request no sharpening *beyond capture sharpening*, since online catalog images need to look reasonably sharp. Most raw processing software applies a certain amount of sharpening as a default, although you can usually adjust this or turn it off. Some photographers, worried there will be no output sharpening, increase this somewhat when processing raw files. Every stock distributor should educate clients the best ways to sharpen images from their collection, since digital images will only look their best when sharpened specifically for the type and final size of output.

Magazine publishers usually specify unsharpened files, as well. But a small amount of capture sharpening will do no harm, while neglecting to sharpen will definitely affect printed quality.

Publication designers and web designers vary in their understanding of sharpening. One possible strategy is to deliver layered TIFF or PSD files at or near final size, with sharpening applied to a duplicate layer, and a ReadMe file and/or delivery memo explaining the layer. Name such a layer “sharpening.” Fuzzy pictures on the web often result from extreme down-sampling of large camera files. One strategy is to deliver smaller files to web designers, typically in the 1024- to 768-pixel range for height or width, and apply a degree of sharpening that looks right at that size. Better web designers will request no sharpening beyond capture (or raw conversion), but will indicate they plan to sharpen appropriately as they resize.

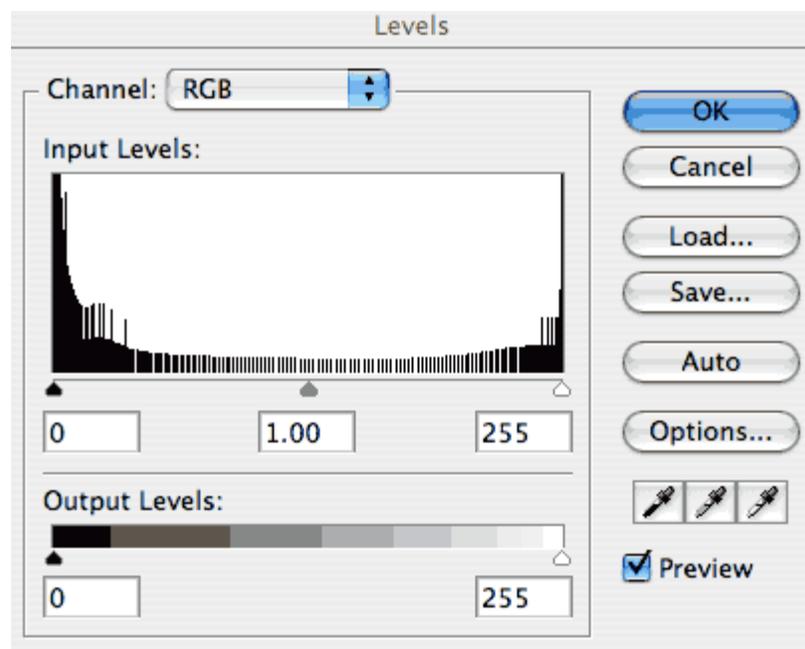
Sharpening is a very complex topic. For a more complete discussion, see Bruce Fraser’s [Real World Image Sharpening](#), Peachpit Press, 2006.

7. Other File Quality Parameters

Excessive unskilled pixel editing can create quality problems

Too much Photoshop-style pixel editing of color and tone, as well as oversharpener, can easily degrade image quality. Keep an image file in 16-bit mode if planning major adjustments, since the greater bit depth allows wider adjustments without loss of detail, posterization or banding.

Editing in a raw converter or in 16-bit mode helps avoid some of the problems associated with aggressive adjustments. Editing images encoded with a greater bit depth than standard 8-bit images offers more intermediate “slots” where the pixel values can move, eliminating many gaps and spikes in the histogram of the finished image.



Result of excessive tone adjustments in an 8-bit file; the comb-like gaps in the graph indicate unused tonal values. Shading gradations that should be imperceptibly smooth will become noticeable, often called “banding.”

Scanning

Use high-quality scanners for film originals. But note the quality of the scan depends as much on operator skill as on the technology employed. Inexpensive flatbed scanners designed for reflective art and documents are not recommended for film. Scans should be viewed at 100 percent on screen to detect dust, hairs, fingerprints and any other problems. Make and store the scans in a wide-gamut color space. Ideally, profile the scanner with a test target and profiling software. Delivered images should be free of sensor dust spots, scan lines, digital aberrations, artifacts, banding, excessive grain, moiré, chromatic aberrations and excessive noise.

Bad processing examples

Michelle Alvarado, photography director at [Panoramic Images](#), has provided the following illustrations of common digital image quality problems. Some of these examples are from film scans, others from digital capture.

Blocked color. Image shows blocked black and bluish color areas. Also, the shadows on the hippo skin appear to be blue in some areas, suggesting a chromatic aberration.

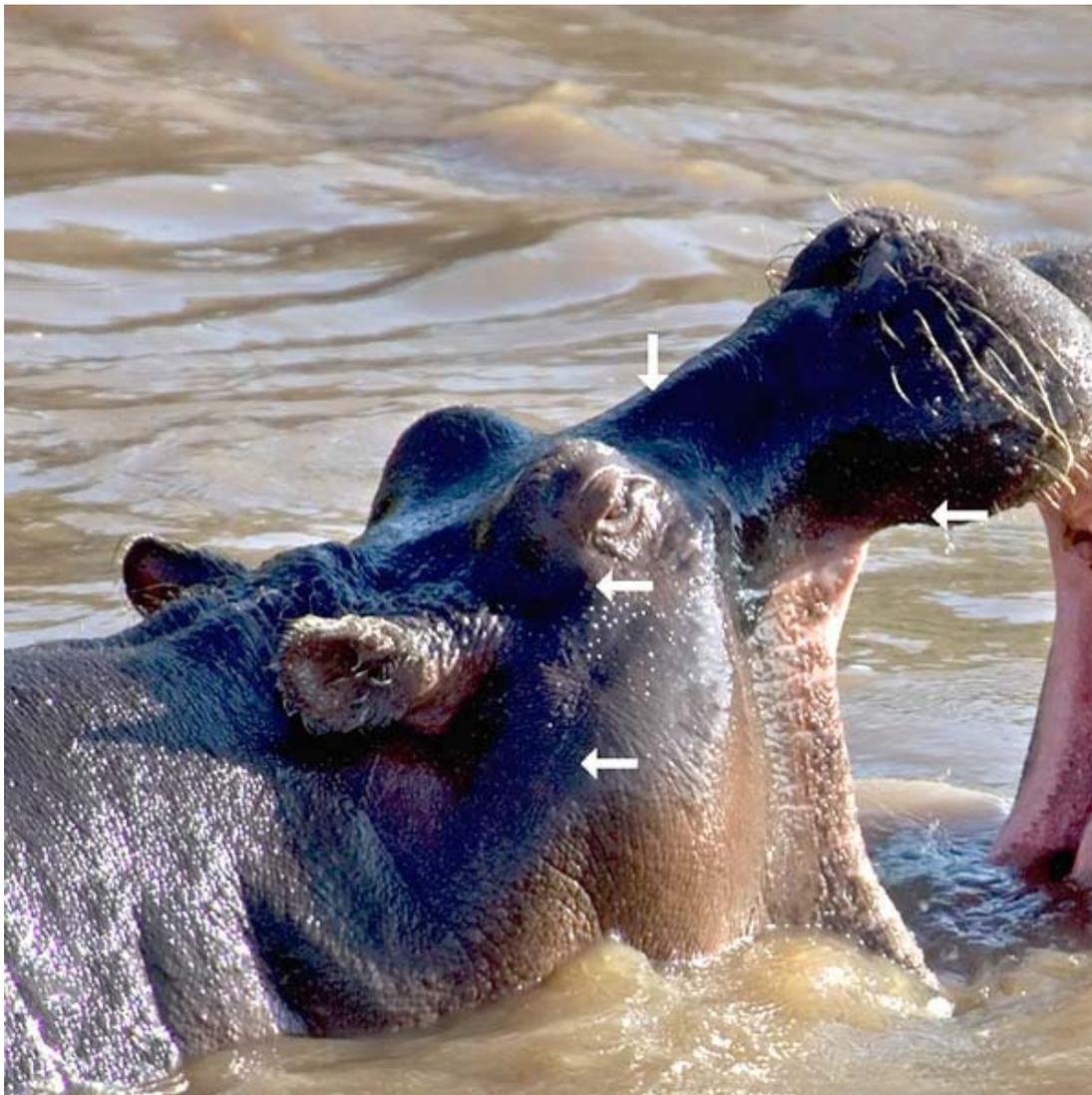
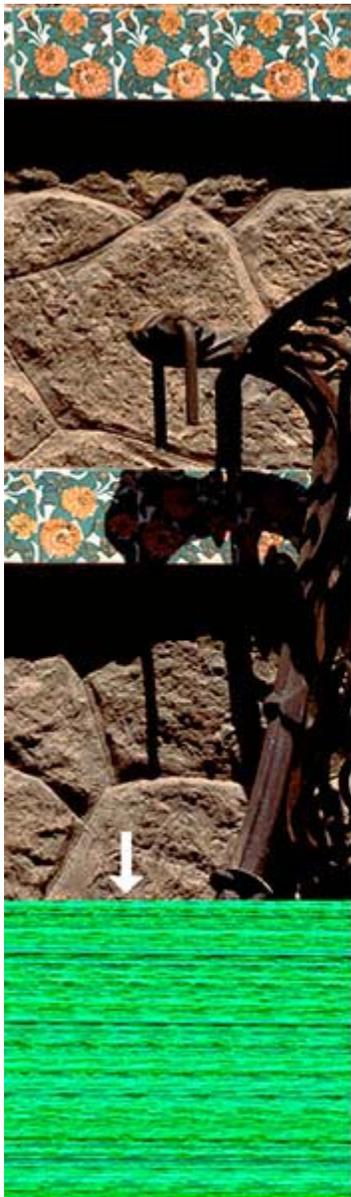


Photo © Panoramic Images

File corruption. Three examples show some different types of visual file corruption. Note the heavy green lines at the bottom of the left image. The middle image has a line that changes position each time this file is opened. The right image has a fixed line that could be mistaken for a power line in this skyline image.



Photos © Panoramic Images

Dirty scan or sensor. This needs spotting to remove specks of dirt, dust and hairs. A dirty digital camera sensor can create a similar effect. If your camera exhibits evidence of dust on the sensor, clean the sensor.



Photo © Panoramic Images

Oversharpened grain. Example of a scanned image with more than usual grain. It also appears oversharpened. If an image is grainy (or a digital image is noisy), avoid oversharpening. There are Photoshop techniques (adding blur) and plug-ins, as well as stand-alone programs, designed to reduce noise and grain.



Photo © Panoramic Images

Moiré. This striped shirt has a moiré pattern. Moiré can result from interference between the sensor grid, and a grid occurring in the original scene. Moving closer or farther away, or tilting the camera slightly, may alleviate moiré at the time of capture. Many cameras have anti-aliasing filters in front to their sensors to counteract moiré, but some do not. If you notice moiré in a captured image, some raw processing software and Photoshop plug-ins can remove or reduce it.



Photo © Panoramic Images

Noise and scan lines. Green scan lines, along with green and red noise, appear in the shadow areas. Digital cameras set at high ISO sensitivities often generate luminance or color noise. If high ISO settings are unavoidable, you can reduce this noise with controls in raw processing software, with Photoshop filters and plug-ins, or with standalone programs.

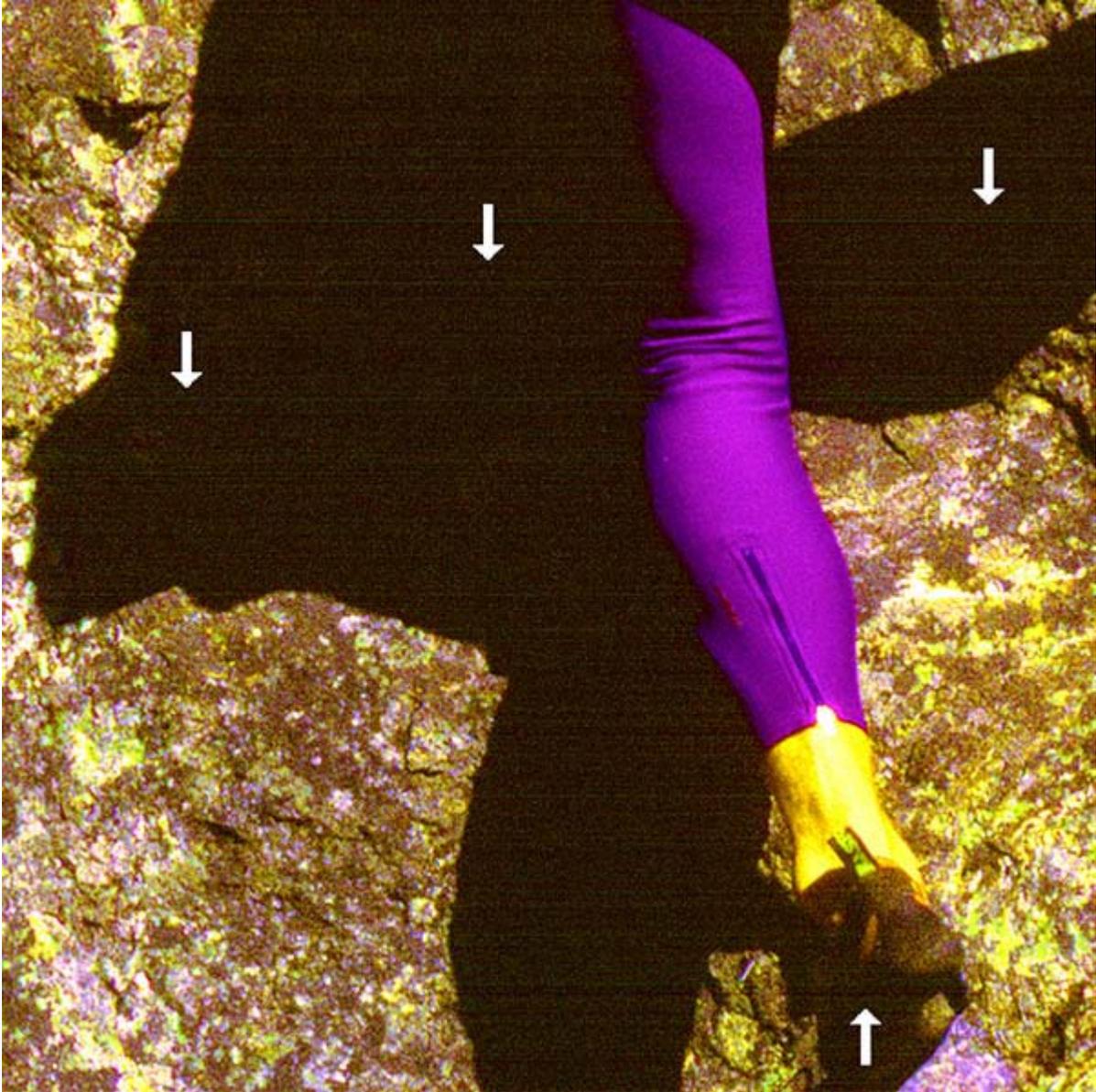


Photo © Panoramic Images

Poor stitching technique. Two digital images are combined below, leaving visible stitch lines and repeated picture elements. High-quality stitching software and careful technique can help reduce this. Carefully evaluate stitched images at 100 percent or larger on your monitor.



Photo © Panoramic Images

Limiting output levels for print

Although we have recommended in the past that digital images prepared for commercial printing should have output levels set between 3 and 253 (RGB mode).

The restriction of levels to between 3 and 253 is a) unnecessary <http://photoshopnews.com/2008/01/14/camera-raw-and-the-shadow-output-levels/> and b) a reflection of incorrect handling of shadows and highlights. (For example: lifting shadow detail

will do more for the image.) The amount of tone restriction depends on the output and should properly be done close to print output. The printer may pull the range in much further. Many publishers will repurpose images for web use the future. It is a mistake to handle all images as if they were being output to print.

8. File Naming

To avoid problems with files transferred across computing platforms, request file names that use only the letters of the Latin alphabet (A-Z, a-z), the numerals 0-9, hyphens and underscores. Avoid other punctuation marks, accented letters, non-Latin letters, and other non-standard characters, such as \:/*<> or brackets. On a local network or with rewritable media, limit the file name to 31 characters or less (including the three-letter file extension). Limit file names to 11 characters or less (including the three-letter file extension) when burning to optical media, since some computers don't support long file names. Use a single period (.) between the file name and extension.

Specify unique file names. Multiple files with the same name will cause problems for computers and people alike, and a newer file might automatically overwrite an older with the same name, or vice-versa. You may want to specify including the numeric date and/or the photographers name as part of the file name as a way to avoid duplicate names.

For a complete guide to file-naming protocol, see the [Controlled Vocabulary web site](#).

Stock image distributors have the greatest need to implement their own file naming conventions, since they have the largest collections, along with the greatest need to search them and link images to their creators. Ideally, stock image distributors would append their naming convention to a creator's file name, but this can become unwieldy. Future versions of the IPTC Core metadata schema should allow storage of multiple filenames. In the interim, putting both the stock image distributor's file name and the creator's file name in the Document Title field may help reduce confusion.

Magazine and newspaper publishers may have similar needs if they maintain picture archives.

Publication and web designers generally require only a user-friendly naming convention. Naming files sequentially and grouping them in a way that relates to the needs of the project usually accomplishes this. Designers should never rename files, but it is usually not a problem if they *add* to the file name, inserting their modification before the file extension. For instance, if the original file name is *07055397.TIFF*, it could be modified to *07055397CMYK.TIFF*, or *07055_397RedTruck.TIFF*.

Until the IPTC Photo Metadata working groups have standardized fields that can accommodate original file names, place the file name in the Document Title field, so that if the file is renamed, it can still be located with its original or delivered name. There are batch methods available for this in Bridge, Expression Media (formerly iView Media Pro), BreezeBrowser and PhotoMechanic.

What happens if someone changes the file name? Putting the photographer's file name in the Document Title field preserves it as a searchable criterion should someone change the name of the image file.

9. Metadata

Overview

Digital image metadata is information about the image. Information like picture number, caption, credit and copyright that used to be carried on the hard copy, should now be found within the digital file so that images are captioned and can be traced back to their supplier and copyright holder.

The use of metadata means that image workflows can be more efficiently automated. If information is added to the image at an early stage, it may not need re-keying, saving time and money throughout the supply chain. All organizations handling images need metadata policies to ensure retention of standard critical information and creation and onward retention of other job specific data. It's increasingly common for stock-image distributors and magazine publishers to develop custom XMP metadata panels that conform to their particular needs.

Technical metadata is created at image capture or creation, and is carried in the image as EXIF data and ICC profiles. This information should be retained by software systems handling images. Removal should be possible for exceptional cases where its retention is in contravention of data, personal or state security. (e.g. The GPS of an image may be hazardous to photographer or subject or to a nation's security).

Rights, captioning and licensing metadata is carried in XMP format in the image file. The various standard schemes in use overlap in places. The information can appear as Adobe XMP fields, IPTC fields, and PLUS fields and is found in the image under File/fileinfo in Photoshop. It can also be viewed by other image viewing and archiving programs, though they vary in the fields they display. It's increasingly common for stock-image distributors and magazine publishers to develop custom XMP metadata panels that conform to their particular needs. A good example is the [BAPLA metadata template](#).

The ability to readily identify and contact the rights holder for an image will likely become critically important if (when) proposed "[Orphan Works](#)" copyright exemptions become law. Bills introduced in the U.S. Congress, if passed, would affect all photographers by allowing anyone possessing an image to copy, modify, distribute, publish and otherwise use it for any purpose, after a reasonably diligent search fails to identify the rights holder. All images previously distributed without rights metadata may soon be vulnerable to unlicensed use as "orphaned" images. Embedding complete, accurate rights metadata will help protect images from unlicensed use. Many other countries are considering similar legislation.

Metadata can be embedded in standard file formats, such as TIFF and JPEG. You can also embed metadata in raw files, although this is only recommended for the Adobe DNG file format, since proprietary raw formats are neither standardized nor publicly documented. For now, with proprietary formats, it's best to attach metadata in a sidecar file. You can also save metadata in

an image database, making sure the image file and its metadata reside in the same volume, folder or program, in order for the metadata to connect to the image file.

A variety of programs can read and write metadata. [Microsoft Expression Media](#) (iView Media Pro), [PhotoMechanic](#) and [ImageIngestor](#) can add metadata as files transfer from camera card to computer. Image editing programs (such as Adobe Photoshop), Image browsers, (such as Adobe Bridge), cataloging programs (such as Expression Media/iView, Extensis [Portfolio](#) and Canto [Cumulus](#)), and all-in-one programs (such as [Adobe Lightroom](#) and [Apple's Aperture](#)) can read, write and edit metadata. Some camera makers' processing software, such as Nikon's [Capture NX](#), provide some basic (usually only legacy IPTC and not IPTC Core) metadata writing, as do some raw processors, such as [Capture One](#).

, Content and Status panels that appear under the *File > File Info* menu in Photoshop.

Types of Metadata:

EXIF: All digital cameras include technical metadata, called [EXIF](#) data. This provides a host of information, such as the camera make and model, its serial number, the date and time of image capture, the shutter speed, lens used, the ISO speed setting, and often, other technical details, such as white balance and distance to the subject. Raw file processing software can use this information to more accurately render images.

ICC Color Profile Tags: Without a color profile tag, the person receiving an image file can only guess the color space used to create and edit it. Always embed an [ICC profile](#) in digital images.

IPTC: This includes user-supplied information. The earliest schema was the [IPTC IIM](#) (Information Interchange Module) model created by the newspaper industry in 1991 and incorporated into Photoshop in 1995. While considered a legacy format, it remains widely used and readable by most software that accesses metadata. The IIM format stores information separately but shares many fields with the XMP format. Referred to as the [IPTC Core](#), or IPTC Core Schema for XMP, it includes the Description, IPTC Contact, Image Extensible Metadata Platform or [XMP](#) is a specific type of extensible markup language used in PDF, photography and photo editing applications. Adobe introduced XMP in 1991. Adobe, IPTC and IDEAlliance collaborated to introduce in 2005 the IPTC Core Schema for XMP, which transfers metadata values from IPTC headers to the more modern and flexible XMP. Stock image distributors and other organizations have since created custom metadata panels that enhance metadata usefulness.

PLUS: The Picture Licensing Universal System is an integrated set of standards for communicating rights metadata associated with commissioned and stock images. The [PLUS standards](#) are developed, approved and maintained by the PLUS Coalition, an international, non-profit umbrella association that includes publishers, designers, advertising agencies, photographers, illustrators, stock image distributors, artist representatives, museums, libraries, and standards bodies, such as UPDIG, IPTC, IDEAlliance and others.

Metadata in Use

The type and amount of metadata photographers should embed in their images depends on who will receive the image files.

Stock image distributors can't function without metadata. They depend particularly on keywords. Stock distributors that ask photographers to add keywords should offer detailed guidance. Captions, which are titles or explanations of images, should be foundations for the keywords that follow. Good keywords explain the *who, what, where, when* and *how* of a picture – important tools for finding specific image files.

You'll find an excellent guide to keywording on the [Controlled Vocabulary web site](#).

In addition to the standard IPTC templates, stock image distributors may elect to create their own custom metadata panels – not only to capture additional data but also to organize it differently from the IPTC defaults. It's easy to install these XMP-based panels in Photoshop (see <http://www.adobe.com/products/xmp/custompanel.html>), and they offer a good way for stock image distributors to insert custom metadata into image files. Although often handled separately, photo releases can be stored in metadata by using a custom template. However, this custom metadata is not yet easily available or interoperable with most image database or cataloging software.

Magazines and publishers also depend on metadata, particularly caption, headline, author, contact information and usage rights. Image files with complete information can save magazines valuable time on deadline. Picture metadata can even provide additional reporting information, especially details such as [GPS](#) data and capture time.

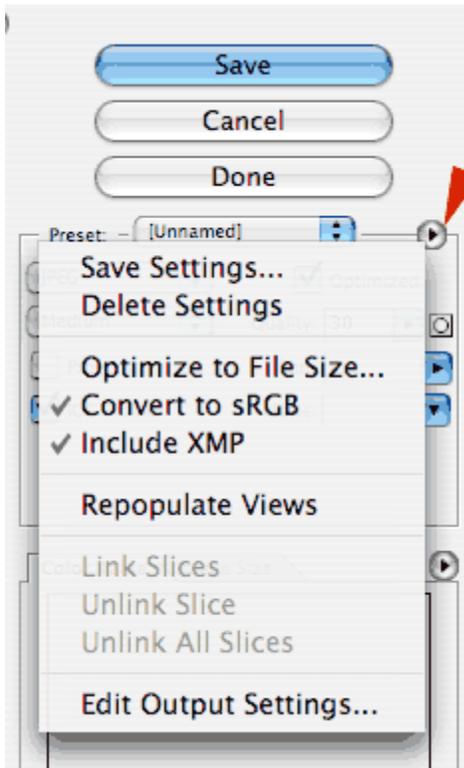
Many publishers have rights-tracking software to verify they have all necessary licenses, have made all necessary payments, and conversely, can track licenses to others for using images they own. Good metadata reduces the cost of operating such systems.

Publishers who lack such software still may need to contact rights holders, perhaps for many years to come. They may need to defend themselves from lawsuits (libel, invasion of privacy, plagiarism, etc.) or undertake a regulatory compliance audit. If a publisher is sold, part of the buyer's "due diligence" includes ensuring its assets are untainted by legal clouds. Metadata reduces the need to rely on paper records.

For all of these reasons, photographers should determine magazine and publisher metadata needs, and when appropriate, install and populate custom metadata templates.

Publication designers can improve their workflow by organizing and categorizing pictures for metadata searches in browsers such as Bridge and digital asset management software such as [Microsoft Expression Media/iView](#), Extensis [Portfolio](#) or Canto [Cumulus](#). For example, if a design firm commissions a series of portraits, it is often critical to include the portrait subject's name in the Description and/or Headline fields. Other fields, such as Origin, can be equally important to a designer assembling a printed piece. The photographer should ascertain these metadata needs, or make the designer aware of how this custom metadata can improve the designer's workflow.

Web designers often have the same organizational and search needs as publications designers. But they have an additional responsibility to prevent metadata stripping. Unfortunately, in the initial release of Adobe Photoshop CS3, *Save For Web* (called *Save For Web & Devices* in CS3) strips most metadata. Although it saves the file description and the creator's copyright notice by default, the feature changes the copyright status to *Unknown*. Beginning with the first CS3



update (Photoshop 10.0.1) it has become easier to discover how to include XMP metadata when using Save For Web. In the updated version, the *Save for Web and Devices* command includes the option to "Include XMP" in the main Save for Web dialog, where users will more likely find it. (In the first CS3 release, the option was buried in a sub-sub-menu.) When this option is enabled, all XMP data – including the creator copyright and contact info – is included in the optimized file, and the copyright status is preserved.

Regrettably, while easier to find than before, the option is not enabled by default. Users must discover it by clicking on a tiny triangle to open a fly-out menu (see illustration), and set it. Once set, however, it stays set.

For most users, Photoshop CS3 will automatically request the upgrade from the Adobe web site and install it. If not, you can download the updater:

For Macintosh:

<http://www.adobe.com/support/downloads/detail.jsp?ftpID=3774>

For Windows: <http://www.adobe.com/support/downloads/detail.jsp?ftpID=3775>

Please note "include XMP" means just that. The new file will not include Legacy IPTC-format metadata. Although many programs that read metadata recognize XMP, there are exceptions, including Apple Preview. This means web designers may still want to use "Save As" instead of "Save For Web & Devices," particularly if their clients are photographers, since some magazine editors review photos in the Preview.

10. Fine Art Reproduction – What Museums Need

Creating and preparing digital reproductions of artworks requires careful attention to details noted above, as well as some specific concerns. Unlike typical photo reproduction, the colors within digital files of artworks should not be subject to interpretation or individual preference. The reproduction must produce the same perceived color (within physical limitations) as the original artwork. To help achieve this goal, it is particularly important to implement the section of the UPDIG guidelines that concerns [preserving embedded profiles](#) and [calibrating your monitor](#).

An [ICC](#) color-managed workflow is essential for proper color handling. This workflow is based on colorimetric matching. In fine-art reproduction, appearance matching must also be considered as a further refinement to the ICC workflow. Practically, this means the image must be considered as a whole and within the context in which it will be viewed. Some appearance matching issues to consider include:

1. When comparing a soft proof to original art, match the white point in both viewing conditions. If viewing the artwork in a booth with 5000K lighting, then the monitor displaying the screen image should also be calibrated to a 5000K white point. Otherwise, the mismatch will invalidate any evaluations of color, because your eyes cannot chromatically adapt to both white points simultaneously. (see footnote)

NOTE: For more detail, please refer to ISO/DIS 12646:2008 (Graphic technology — displays for colour proofing – characteristics and viewing conditions) and ISO 3664:2000 (Viewing conditions – Graphic technology and photography).

2. When comparing a soft proof to a hard-copy proof, a white border of at least 1 inch must surround the soft proof.
3. Do not compare individual colors in isolation, since they may need to be different colorimetric colors in order to produce the same color appearance within the context of the whole image.
4. View the reproduction at an appropriate viewing distance. If it is to be printed on an 8½x11-inch page and the original art is much larger, if viewed together they must not be side-by-side, but rather each should be assessed at their natural viewing distances.

For art reproduction, raw and DNG formats are not recommended as submission formats, since the images will need different rendering, depending on the final output, in order to maintain consistent color appearance. The only way to control this is by providing a rendered image tagged with an ICC profile.

Imaging Workflow

Image Capture. The only way to control digital captures for art reproduction is with professional equipment. Consumer-grade cameras and scanners introduce image processing intended to create *preferred* color for typical photography. This type of processing is counter-productive when the goal is appearance matching.

For two-dimensional art, first perform [flat fielding](#) to compensate for lens falloff and uneven lighting. For 3-dimensional art, flat fielding is necessary only while capturing the calibration target. Next, calibrate the camera's color. There are several solutions available for this. Depending on the art being photographed, some solutions may perform better than others, so try multiple solutions to find which work(s) best for different art media.

The most common reason for a camera calibration to fail is [metamerism](#). Because cameras see color differently than people, different artists' materials (oil paint, watercolor, silver-gelatin photographs, chalk, etc.) can appear to have the same color yet photograph differently. The more widely the spectral nature of the materials photographed differ from the materials in the calibration target (such as a GretagMacbeth [Digital ColorChecker SG](#)), the more likely there will be color errors. Making a custom target from the same materials you are photographing can alleviate this problem, although doing so properly is difficult.

Scanning. Scanning transparencies is more straightforward than digital capture. Use one of the excellent, available software solutions to characterize (profile) your scanner. It is also very important to consider whether a transparency accurately represents the art. Transparencies have

narrower limits in color fidelity when compared to digital captures and generally require more color-editing effort.

Printing. Characterize your printer by creating an ICC profile, and apply that profile in your printing workflow. Affordable consultants can help with this.

File Standards. Images extracted from the internet and video are unacceptable for art reproduction. Most images from these sources contain insufficient resolution or color gamut to produce quality reproductions, lack proper color management information and could have copyright problems.

Applying these best practices should produce digital files that meet the general specifications outlined above, although modifying existing files to meet these standards can be difficult. Such practices as resampling, color-space conversions (changing the color gamut), color mode conversions (between RGB and CMYK) and file format conversion (*e.g.*, low-quality JPEG to TIFF) may cause more harm than good. Unless you have the experience to understand the consequences of each adjustment, leave an image as it is. The best workflow is one that conforms to these standards *from the initial image capture*.

File delivery

Outbound. When supplying images, it is also important to conform to the guidelines in this document. Ideally, provide a guide print along with a ReadMe file to instruct printers in correct color handling. As online delivery systems for press-ready files continue to proliferate, it will not always be possible or cost-effective to deliver guide prints. For this reason, printers who have adopted an ICC workflow should be favored.

Inbound. To receive images from outside sources, ask the provider for image files that conform to the guidelines in this document. Sample request language follows:

File Request Template

Please provide digital files as follows:

Resolution: 400 pixels per inch

Size: 12 inches long dimension

Bit-Depth: 8-bit

Color Space: Adobe RGB (1998)

File Format: TIFF or high-quality JPEG

ICC Profile: Embedded

NOTES:

- When viewed under standard prepress conditions – 5000K illumination of the artwork and 5000K monitor white point – the digital file's appearance should match the original work.
- You may sharpen the image to compensate for loss of detail during capture, but do not apply output sharpening, which will vary based on a particular press and reproduction size.
- The artworks should be photographed unframed and unmatted.
- Please provide information to link digital file names to the works of art.
- The production of these files should follow best practices in color management: Profile the camera and assign that profile to the original capture. Then convert that file to Adobe RGB (1998) color space and embed that profile.

Files submitted as above allow us to extract details and make moderate-size reproductions without up-sampling.

A more detailed discussion of the topics introduced here, including templates and instructions for printers, can be found at www.ImageMuse.org.

Appendix

ICC Color Management

[ICC](#) International Color Consortium [ICC White Papers](#)

[X-rite](#) color measurement and color management, offering hardware, software and services for measuring, formulating and matching color including [Color Checkers](#)

[Chromix](#) Color Services, Color Think Software

[SWOP](#) Specifications Web Offset Publications

[SWOP-certified systems](#) This page lists the SWOP certified proofing systems

[GRACoL](#) General Requirements for Applications in Commercial Offset Lithography

[FOGRA](#) Graphic Technology Research Association

[IFRA](#) Global research and service organization for the news publishing industry.

[ECI](#) European Color Initiative

[ISO](#) International Organization for Standardization

[Dry Creek Photo](#) Digital Imaging Resources for Photographers by Photographers

[Colorremedies](#) Color Management Essential Training

Metadata

[EXIF.org - EXIF and related resources](#)

[Orphan Works](#) Orphan works are basically works whose copyright owners cannot be located.

[EXIF](#) The specification uses the existing [JPEG](#), [TIFF](#) Rev. 6.0, and [RIFF WAV](#) file formats, with the addition of specific [metadata](#) tags. It is not supported in [JPEG 2000](#), [PNG](#), or [GIF](#).

[IPTC IIM](#) the first multi-media news exchange format

[IPTC Core](#) This page is about IPTC metadata to be used within Adobe's Extensible Metadata Platform framework.

[XMP](#) (Extensible Metadata Platform) a standard for metadata, created by [Adobe Systems Inc.](#)

[PLUS standards](#) An international non-profit initiative on a mission to *simplify and facilitate the*

communication and management of image rights.

[Controlled Vocabulary web site](#) Recommendations for Limitations on Image Filenaming

<http://www.adobe.com/products/xmp/custompanel.html> The custom File Info panel for XMP metadata allows you to define, create, and manage custom metadata properties using standard Adobe applications

Software

[Bibble](#) Professional Workflow and raw Conversion software for Windows, Mac OS X, and Linux

[Capture NX](#) Nikon's software for simpler, more intuitive full-scale digital image processing and editing

[Capture One](#) Raw workflow software from Phase One

[Aperture](#) Import, manage, and enhance your photos in one simple, integrated workflow

[Microsoft Expression Media 2](#) is a powerful and customizable image management software application for importing, annotating, organizing, archiving, searching and distributing your ever-growing collection of digital files.

[HindSight](#) Software for Professional Photographers including MetaMachine

[PhotoMechanic](#) Photo Mechanic is designed to work with groups of photos together in order to manage them.

[ImageIngestor](#) double backup; naming; moving to folders; applying bulk metadata and Camera Raw/Lightroom settings; GPS tagging; converting to DNG; verifying; correlating multi-camera shoots.

[BreezeBrowser](#) Used to [download](#), [browse](#), select, [organize](#) and [post process](#) their images, [create web galleries](#) and [control cameras](#) from a Windows PC.

[Cumulus](#) Digital Asset Management software and hardware

[Portfolio](#) Digital Asset Management software and hardware

[DXO Optics Pro](#) is a multi-award winning program running on Windows or Macintosh to automatically improve image quality.

[Silkypix Developer Studio](#) adjust the color, tone, and the white balance of the image can truly help you express your feelings through the photography.

[DAM Useful](#) Digital Asset Management and Workflow Software

Adobe Software

[ACR](#) (Adobe Camera Raw) Digital camera raw file support.

[AcrCalibrator](#) Tom Fors' calibration script for ACR. [Visual Vacations](#) ACR calibration tutorial

[Lightroom](#) Lightroom® software is the professional photographer's essential toolbox, providing one easy application for managing, adjusting, and presenting large volumes of digital photographs so you can spend less time in front of the computer and more time behind the lens.

Monitor Calibration

[PDF manual](#) how to calibrate and profile both CRT and LCD monitors

[Gretag-MacBeth Eye-One](#) Colorimeter

[Color Vision Spyder 3 Elite](#) Colorimeter

[ColorEyes Display](#) Color profiling software and hardware

[Profile Verification Kit](#) by Pixl Ltd.

[Black Point Check](#)

[Grayscale Test](#)

[W](#) cathode ray tube

[W](#) liquid crystal display

[W](#) white point

[W](#) color temperature

[W](#) color look up table

[W](#) gamma correction

[W](#) luminance

File Formats

[DNG file format](#) (Digital Negative) The public, archival format for digital camera raw data

[Luminous Landscape site](#) A good analysis of the raw Flaw

[OpenRAW](#) Organization hoping to persuade camera makers to provide open documentation of their proprietary raw formats.

[OpenRAW survey](#) The 2006 raw Survey – A Report on the Experiences, Requirements, Beliefs, and Preferences of Photographers and Imaging Professionals regarding raw Imaging Technology

File Delivery

[YouSendIt](#) FTP file delivery service

[SmugMug](#) Online gallery and image sharing service

Web Color

http://www.northlight-images.co.uk/article_pages/web-browser-color-management.html* web browser color management

<http://regex.info/blog/photo-tech/color-spaces-page2/>* web browser color management

Books

[The DAM Book](#): Digital Asset Management for Photographers, By Peter Krogh

[Practical Color Management](#): Eddie Tapp

[Real World Camera RAW](#): Broce Fraser and Jeff Schewe

[Real World Color Management](#): Bruce Fraser, Chris Murphy, Fred Bunting

[O'Reilly](#) O'Reilly Media spreads the knowledge of innovators through its books, online services, magazine, and conferences

[Peach Pit](#) Essential resources for the creative community

Blogs and Forums

[The Dam Forum](#)

[John Nack on Adobe](#)

[The Lightroom Journal](#)

[Photoshop News](#)

Consultants

[Peter Krogh](#)- Digital Asset Management

[Andrew Rodney](#)- Color Management

[Neil Barstow](#)- Color Management

[Chris Murphy](#)- Color Management