



Introduction

For many photographers, the print represents the culmination of all the work that goes into creating a meaningful photograph. After time spent shooting, reviewing, and editing, a print is a physical object representing the culmination of all that work. It is something that can be held, shared, and looked at over and over again. The print holds a sense of permanence that creates a different relationship to the photograph than sharing images in social media or online.

There are many reasons to print your photographs. In my opinion, printing is one of the fastest and easiest ways to become a better photographer. You look at and analyze images differently when they are printed on paper versus just looking at them on screen. We see the tone and colors differently. We see the relationships between the objects and the shapes in the photo differently. It is also often easier to see things that need to be corrected in the print or corrected when shooting than it is to see these things on a computer screen.

It's inspiring to see your work as a print hanging on the wall. The sense of accomplishment that comes from putting a stake in the ground—saying that this print is done and ready for the wall—is hugely satisfying. Printing is also a way to make sure that your voice as an artist is showing through. For a photographer, it is the ultimate presentation of what you see and how you want to tell the story of that image.

In my years of teaching, I've learned that the idea of printing is exciting for most photographers, and it seems easy on the surface, but in reality, getting a good print is more work than most people anticipate. Frustration can take hold and cause us to give up printing or cause us to think that we can't get a good print. Although the process of printing does involve a number of steps, once you get a workflow established and a checklist created to get an amazing print, you might find that you can start getting those images out of the computer and onto a wall.

When we start to think about printing, most of us sit down in front of the computer and start editing an image to print. We make all the edits, send it off to the printer, and cross our fingers that everything will be ok. Unfortunately, often everything doesn't come out ok. So, how do we go about getting really great prints?

Setting up your workspace

When you start printing, you want to make sure that your editing workspace is set up to be as neutral and consistent as possible. Your eyes are amazing, color-sensitive tools, but they can be easily confused and distracted by bright colors and high-contrast colors, so a neutral background for your desktop wallpaper when you are working is recommended. I also recommend that you set your preferences in Photoshop or Lightroom to have middle gray or dark gray backgrounds, too. Avoid white and black backgrounds since they can lead you astray when judging the contrast in an image.

Also, pay particular attention to the colors in the room and the color of clothing you wear. Colors reflect off a variety of surfaces and can cause accidental colors to appear on the monitor or print. Having a neutral environment will help you get more consistent results from one print session to the next.

You should also try to control the lighting in the room. Have a consistent quality of light will make a huge difference in your ability to get consistent editing results.

Paper selection

One of the biggest impacts to a print is the paper on which the image is printed. Paper can make a huge difference in how we respond to a given image. Many of the decisions

that we think about in editing are enhanced by or dilute our vision based on the papers or substrates we use. Should the print be highly saturated or muted? Are there lots of fine details in the print or more smooth gradients? Do you imagine the print with more or less contrast? As you start to imagine the print itself, you will be able to start to think about substrate that you want to print your image on so that you are able to emphasize the qualities of the image that you want.

I encourage people to start by understanding some of the paper basics. With so many paper choices from so many companies, it's important to understand how these papers compare.

Paper qualities

When I work with people who are getting started in printing, the first quality most think of is cost. And sure, cost is one factor, but it is not the only consideration. It's not uncommon to have a cheaper proofing paper that you can work out a lot of the details of the print with and then move to the higher-end papers for your final prints. I personally use an Epson and a Red River Luster paper for my proofing to help save on cost. But all my final prints are on my fine art papers.

When thinking about paper, there are many additional aspects to consider:

- **Texture.** What does the paper feel like? Some papers have more tooth and texture than other papers. This texture can shift how the eye experiences the edges, colors, and contrast of the image. A smoother texture can help hold subtle gradients versus a toothy paper. Does the texture enhance or detract from the viewing experience?
- **Archivability.** How long the paper will last is an important aspect of fine art prints. Most modern pigment-based printers have inks that will last 100 to 200 years when printed on archival papers. You want to make sure that your prints will last and not fade. You can learn about the archival quality of most papers from the manufacturer's website or from the [Wilhelm-Research](#) site.
- **Thickness.** Paper thickness is also an indicator of the quality of the paper. Matte and fine art papers will often be heavier than glossy papers. The construction of the paper and how the surfaces are prepared to accept the ink will determine the thickness. Most papers are measured in grams per square meter (GSM, also seen as g/m²) or bond weight. The larger the GSM or bond number, the heavier the paper. Most fine art papers are between 200 and 300 GSM. However, there are some beautiful art papers (Japanese rice paper, for example) that are extremely thin. So don't just use thickness as the sole indicator of quality. Thickness is also a key factor in opacity or how see-through the paper is.

- **Contrast.** The maximum black in a print is known as D-max and the brightest point is the D-min. The difference between these values is the contrast range. Most papers have a contrast range between 50:1 and 200:1.
- **Surface.** The surface of the paper is one of the more common options people consider. Do you want a glossy, luster, or matte surface? The glossier the surface, the deeper the blacks and the steeper the contrast curve. However, matte papers offer a richness that is different in quality and nuance from glossy. Most people end up with both a glossy and a matte paper or two. Being familiar with both gives you more options for what you ultimately want the print to look like.
- **Brightness.** How bright is the paper? Is it super white and bright or is it a little dull? Most good papers are +90 in their brightness values. You can also look for papers with and without optical brightener agents (OBAs). OBAs are added to papers to make them brighter than the paper base. Some people don't like them in their prints and express concern about the effect on the archival quality of the prints with OBAs. For others, the archivable testing results have made this a non-issue. OBAs tend to have a slight blue cast to them that can affect the quality of the cool and warm tones in the print.
- **Gamut.** Each paper has a particular gamut, or volume, of colors that it can represent. The gamut is unique to the paper and paper/ink combination. The gamut is represented by an International Color Consortium (ICC) printing profile. When you start to consider papers, understanding what papers offer in terms of color volume can be a very important consideration to get the look and feel of the colors and tones that you want in your print.
- **D-max.** D-max is the richness of the color black as measured with a reflective densitometer. It is a measured way to determine how pure a black any given paper can display. For practical purposes, we consider a D-max of 4.0 to be the highest. With modern papers and inks, it is possible to get a D-max of around 2.6. Which is amazing considering that analog silver gelatin prints are around 2.3 to 2.35.

Most prints will be in the range of 2.0 to 2.5. Most paper densities start on the low end around 1.8 and go up from there.

- **Size.** Papers come in a variety of sizes as well as sheet and rolls. Many papers are described using the A Series size model, which is slightly different from US paper sizes. It is important to check your paper sizes when loading your printer or you might have unexpected margins.

When you select a paper, you will need to download the proper paper profile from the paper manufacturer or have a profile created. Either way, when you get the profile, it should come with some installation instructions, including what options you need to set in the **Printer Settings** dialog box.

Sample packs

Nearly every paper company has a sample pack of paper. If you are unsure of what paper you want to use, it is worth it to get a few of the various sample packs. These packs usually have one or two sheets of each type of paper. You can then make some sample prints to judge the quality of the paper without having to spend a ton of money on a paper that you will potentially not want to print with.

Sample print file

One recommendation I make when you are testing papers is to print the exact same images on the various papers. That will let you have a direct comparison between the various papers. One of the most popular test prints is from [Digital Outback Photo](#). I have also created my own test print for my personal testing and have included that .tif in the download section with this document.

The sample print file has a number of images so you can see the impact of the paper on skin tones, saturation, and color values. The file also has various color charts and graphs to show the impact on the paper gamut. Finally, it has black and white values to help determine the D-max and D-min numbers for the various papers.

Color management

While it might be possible to consistently get good prints without color management, I would say that your odds of winning the lottery while being eaten by a bear wearing a shark suit are higher. Without color management, we don't have a way to maintain consistent, repeatable, and known color values. It is worth noting that as good as color management is these days, a calibrated and color managed system doesn't mean that you will just click and print. You'll almost always need to create some proof prints to be able to get exactly what you want before your final print rolls off the printer. In addition to the work to get the computer's color management properly set up, learning how to deal with the difference between transmissive light and reflective light, color temperature of the viewing lights, issues with metamerism, and a host of other issues are important to get reliable color.

Don't let all the variables scare you off: it isn't as hard as it sounds. Properly calibrated color management systems do an amazing job of being able to show or simulate what

will happen when we print. At its core, color management is about describing color, measuring color, and converting color. All of this work is done by the computer's color management system through the use of color profiles and color spaces.

There are three basic types of color profiles. Most profiles are known as ICC profiles. The International Color Consortium for which the ICC profiles are named is a group of companies that created and maintain the open platform that we use for color management. The three basic profile types are:

- **Input profiles** are used to describe the colors that are defined by the capture device, such as a camera or scanner, and how those colors are converted into a standard color space like CIE L*a*b*.
- **Display profiles** are used to describe the colors of your monitors. A display profile is created with a color management monitor calibration tool. To create a display profile you need a piece of hardware that is used in combination with software to create the proper profile for your monitor. The two most commonly used companies are X-Rite with their i1 or Colormunki line and Datacolor's Spyder product line.
- **Output profiles** are used to describe the colors of your printer and paper combination or other output device. These profiles are provided by the manufacturer, or you can custom build your own profiles by using a paper profiling device and software from a company like X-Rite or Datacolor.

We also have a number of working color space profiles. Working color spaces such as sRGB, Adobe RGB (1998), or ProPhoto RGB are profiles that have been accepted as standards across devices. When we are in Lightroom or Photoshop, we use these color spaces to describe the colors that are available to use while editing the image.

Display calibration notes

One of the biggest issues I see happen when people are printing is that their prints are too dark. This is normally caused by the monitor not being calibrated properly. You want to make sure that the brightness of the monitor is turned down. For most people I recommend between 80 and 100 lumens. You can set your monitors white point to native, D50 or D65 as your white point. For most people D65 makes the most sense because of the color of the papers leaning towards blue. The D65 setting helps make the screen values appear more consistent to the paper. Some monitors work better set to native to avoid highlight clipping. In my own setup, I use D50 with a lumens of 90. Both those value are determined by my editing environment. You will need to do a little testing to figure out what values work for you, but the calibration software will help you set the corrected values.

Gamut

Each profile type has a specific gamut. Gamut is the amount or volume of color that can be represented by the device. When an image has colors that exceed the range and volume of the device, we call that being out of gamut. The ICC developed a number of ways to deal with colors that need to be shifted in the conversion process when images or colors are out of gamut or changing color spaces. The conversion process is handled by the rendering intent.

Rendering intent

Rendering intents are used to tell the color management system how to translate and convert colors from one color space to another. This process is important not just for out-of-gamut colors but also for in-gamut colors when converting from larger color spaces such as Pro Photo RGB to smaller color spaces such as sRGB. There are four rendering intents. For our purposes, we will focus on the two used by photographers, called relative and perceptual:

- **Relative.** This is my default rendering intent. This rendering intent is used for images where brightness values need to remain consistent and colors are more natural in value. Colors that are shifted in this intent are clipped to the nearest reproducible color in the color space. This is best for images that have mostly in-gamut colors, colors brightness values for in-gamut colors or for black and white images. You may get less-saturated colors from out of gamut colors, but more saturated colors from in-gamut colors than with the perceptual rendering intent.
- **Perceptual.** This rendering intent will maintain the relationships of out-of-gamut colors to preserve the color relationships by shifting in-gamut colors. This is at a cost of color fidelity and luminosity shifts. You can offset these, but they are likely to occur with this option. This option is best used with highly saturated images, when the relationship of the colors is critical, or with images with colors that are more out of gamut. You are more likely to see artifacts such as posterization develop with this rendering intent.

How to determine the proper rendering intent is described in detail in the soft proofing section.

Color of lights

Another key consideration is the color temperature of the light in the room where you are going to view the prints. A lot of gallery spaces use warmer bulbs. These bulbs are around 3,500° K (Kelvin) and produce a slightly more yellow light. If you are showing

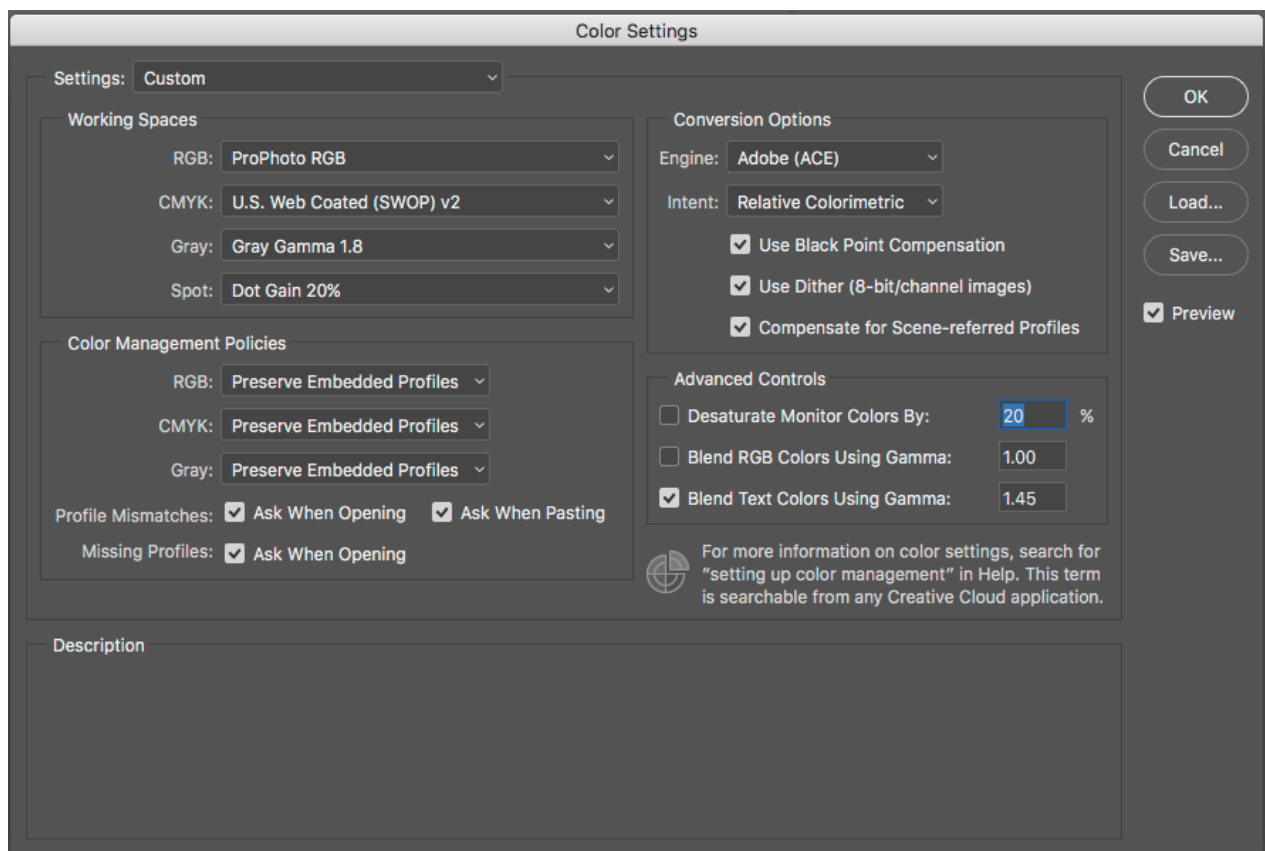
your images under daylight or 5,000° K, there will be more blue in the lights. If you are printing your image expecting them to be under daylight, and they end up being shown under warmer bulbs, the prints can tend to look like they have a warm cast. The opposite is also possible. If you view a print under warmer bulbs to proof and they are shown under daylight bulbs, they could have a blue cast. While you might not always have the opportunity to control the color of the light—because either you don't know or it ends up as mixed lighting—you should try to print to a consistent standard.

For lighting solutions, I can't recommend [Solux](#) enough. You can get very consistent and balanced light for your studio. They sell a variety of temperatures. For color calibration work, it is best to use 5,000° K bulbs. My final prints for studio viewing are judged under 3,500° K bulbs.

Color management in Photoshop

There are a lot of options for setting up color management in Photoshop, and because there are so many options, it is easy to get sideways. For my setup, I set up a few key options to make my workflow as easy as possible, and I try not to get lost in the weeds.

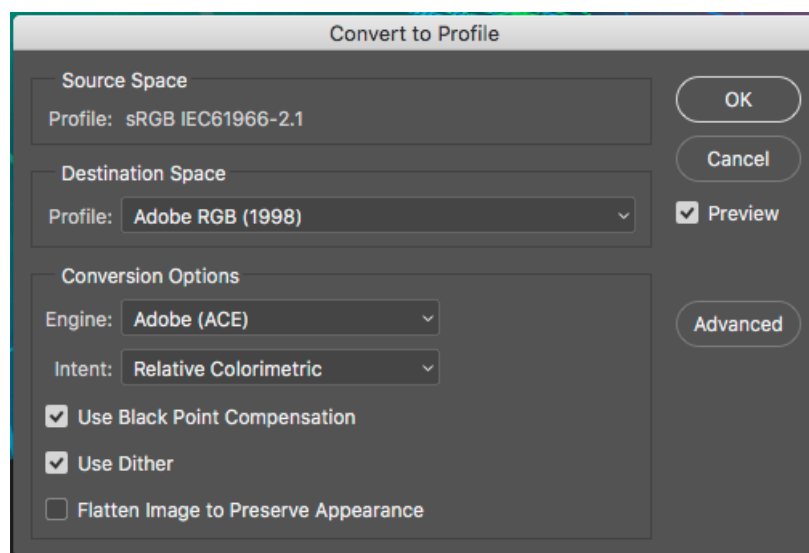
To get to the color management settings in Photoshop, select **Color Settings** from the **Edit** menu.



In the screen capture above, you can see the settings that I use. I want to make sure that my Working Spaces boxes are setup properly. For RGB, I use **ProPhoto RGB**, because I want the largest color space to work with on my images. My **Gray** value is set to **Gray Gamma 1.8**. The gray space should be set to match the RGB color space that you are using. ProPhoto uses a Gamma Gray of 1.8. Adobe RGB (1998) uses a gamma gray of 2.2. The sRGB should be set to Gamma Gray 2.2, although it is technically not Gamma Gray 2.2 but a slight modification of Gamma Gray 2.2. The **Gray** profile is used to render black and white and brightness of the mid tones.

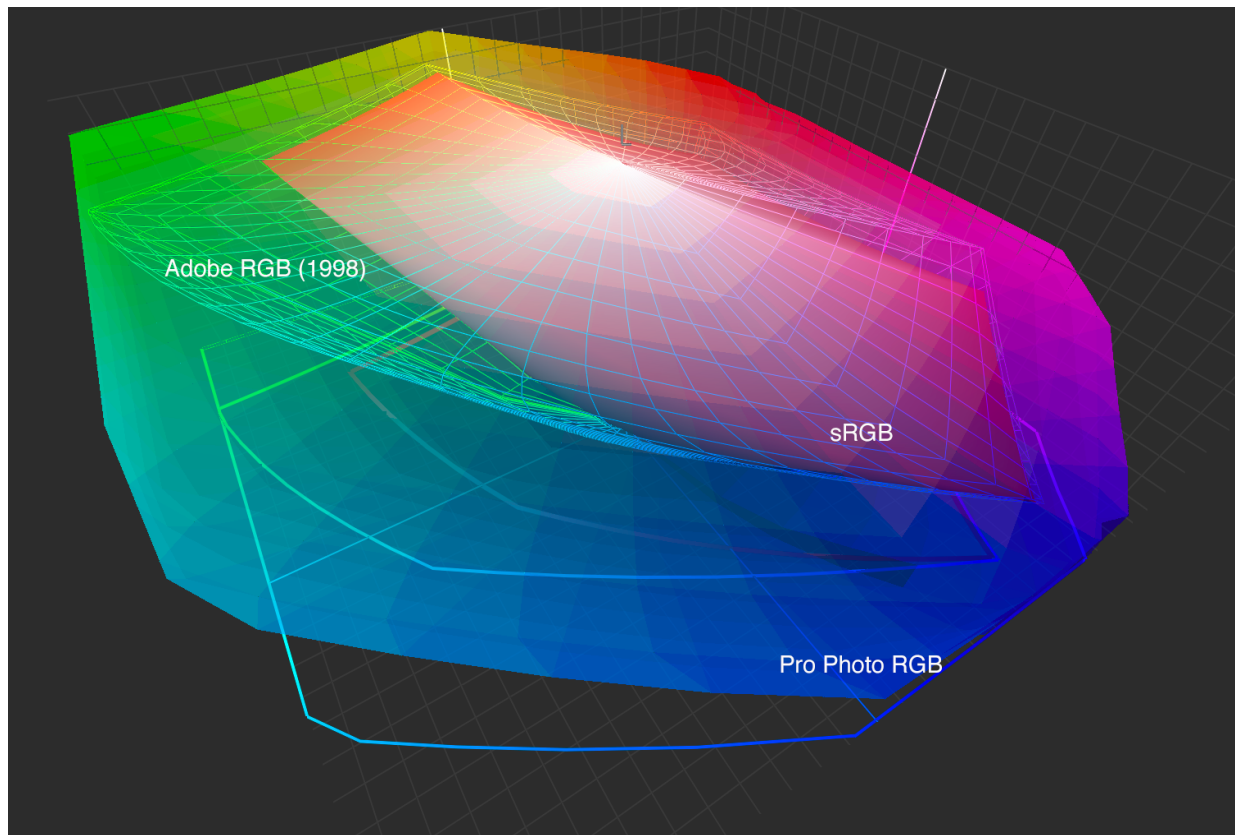
Under **Conversion Options**, I set my **Intent** to **Relative Colorimetric**, and I also make sure to check the boxes about profile mismatches so that I am warned when opening files or images that are outside my default color settings.

Under **Color Management Policies**, I make a few changes from the defaults. This section is all about what Photoshop should do when there is a profile mismatch or profile issue. When you are working with files that have mismatched profiles, it is easy to get confused about which option to select. In many cases, you will want to use the embedded profile because that is what the intended profile was when you received the file. But there are times when you will want to change the profile of the image. When you select **Assign profile**, Photoshop keeps the numbers and changes the color's appearance. This option is used most often when a profile is missing. **Convert to Profile** allows you to keep the color appearance but the number assigned to the color changes. In nearly every case, I want to Convert to Profile with my photographs so that the color's appearance remains accurate.



Color space sizes

It's important to think about the difference in color gamut between the color spaces and think about why you would want to work in Pro Photo RGB. The chart below shows the relative sizes between sRGB, Adobe RGB (1998), and ProPhoto RGB. In the image on the largest continuous color block is Pro Photo RGB, and the wireframe is Adobe RGB (1998), and sRGB is the reddish color block in the center.



As you can see, the Pro Photo RGB space is considerably larger than the other spaces. The Pro Photo RGB space is extremely close, and some cases exceed normal human color perception. For my photographs, I want to use the largest color space I can, so I default to Pro Photo RGB. There are some cases when you might want to work in Adobe RGB (1998) or sRGB. In some cases skin tones render better in AdobeRGB (1998), and there are number of alternative processes digital negatives that are printed in Adobe RGB (1998). But, for the most part I want that Pro Photo RGB color volume.

Working in Photoshop

If you have ever printed anything then you know that the printer is not that smart. It prints what you send it. If you send it a bad photograph, it prints a bad photograph. Much of the work to get a good print involves making smart decisions in the editing process.

Optimize the file

From the beginning, you want the most information possible. This means working in the Pro Photo RGB color and working with 16-bit files. The larger color space and larger bit-depth will give you more options and reduce the risk of creating artifacts in your files.

It is critical that you also develop a workflow that can minimize the artifacts that happen in your files. Most adjustments being done to a file are cumulative and some have a multiplicative effect. For some adjustments this isn't a big deal, but in other cases this can be a problem.

Sharpening is an example of such an adjustment where it is a big deal. It is really easy to over sharpen an image or parts of an image because each time you sharpen a file that effect is added to the prior sharpening. There are other adjustments that can have the same effect. What you want to do is to develop a workflow that will minimize the unwanted artifacts that can appear in a print.

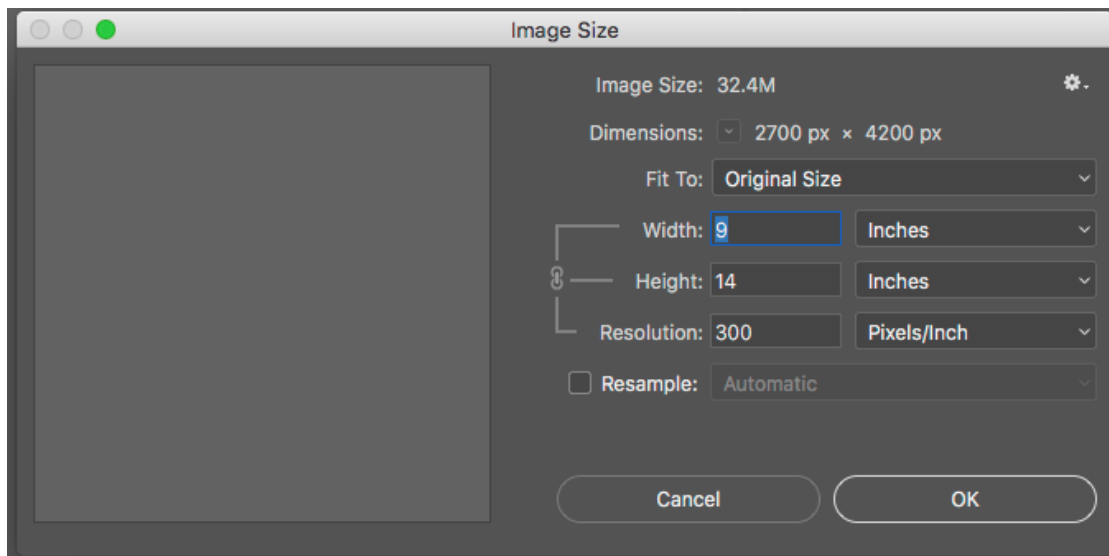
You also want to make sure that you have the workflow set up to be non-destructive. Unlike a RAW editing program such as Lightroom, Photoshop will let you directly edit and manipulate the pixels in your file. If you make a print and need to change some aspect of the file, you want to make sure that you can adjust the file without having to recreate all the settings necessary to rebuild the file. Using **Smart Objects**, **Smart Filters**, **Layers**, and **Adjustments Layers** will help ensure that you can edit your images using a flexible workflow for greater printing options.

Sizing and resolution

As a general rule of thumb, the viewing distance of an image is 2 times the diagonal of the image. So, an 8 x 10-inch image has a viewing distance of about two feet, and at that distance, our eyes are able to resolve about 280 to 320 dots per inch (dpi).

Whereas a 30 x 40-inch print has a viewing distance of about eight feet, with the eye being able to resolve about 150 to 180 dpi. The greater the viewing distance, the less resolution is needed. However, for fine art prints, they will often be well lit and viewed from a closer distance than other objects, so I tend to recommend that you print a little higher resolution than what might be our eyes' theoretical resolving power.

Because there are a couple of printing workflow steps that you need to do once the image has been resized, you will need to resize the image to the final print size. To resize an image, use **Image Size** from the **Image** menu.



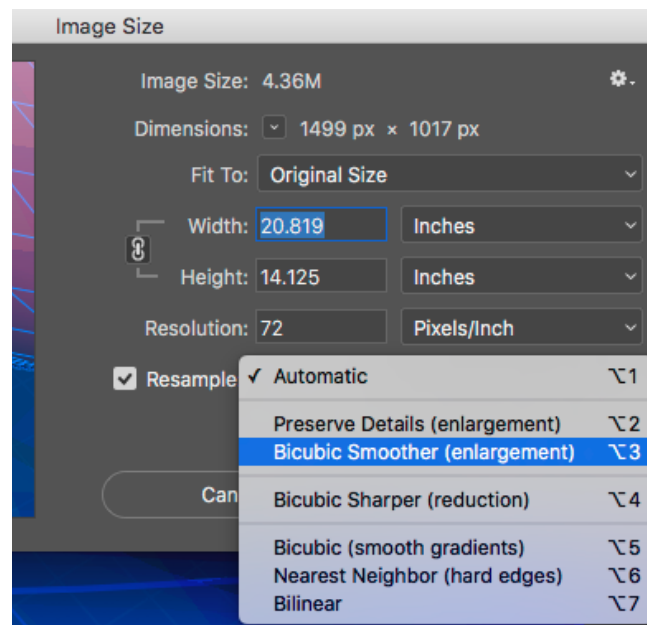
Normally, I don't want to resample my master file at all. So, if I have to resample, I often do the resize work in a duplicate of the file, so I don't inadvertently resize my master file.

I will adjust my image print width and height or the resolution with the **Resample** box unchecked. As long as the resolution of the image can stay above the print dpi threshold (for me that is 200 dpi), then I know I won't need to resample the image.

For most of my prints, I want to make sure that I have enough resolution to hold all the detail in the highlights and shadows but not more than I need so that I am just wasting ink. I also want to make sure that the resolution is enough to generate the highest quality prints possible, so I might need to resample an image if it appears to create a better quality print than a non-resampled image. Based on my testing, my general rule of thumb is that 200 dpi on larger prints produces an acceptable print quality and about 350 to 450 on smaller prints is acceptable. I have printed as high as 720 dpi on smaller prints from larger files with no issues.

When you are printing on an Epson printer, it defaults to 360 dpi, while a Canon printer defaults to 300 dpi. Ideally, you would be able to send the printer its native resolution. In some cases, you can get less than ideal results by using nonstandard resolutions, but you will want to test that for your own printer and quality control standards.

If you are working with a service bureau, then they can provide you with specific output requirements for your file sizes.



If you do need to resample an image, Photoshop CC has some amazing options for how to deal with the details, edges, and values of the image during the resampling. If you are up sampling, then you can select **Bicubic Smoother** to help preserve the gradations and tones in the image. If you are down sampling, select **Bicubic Sharper** to get a sharper image, but this effect can be rather strong at times, so you might want to experiment before just selecting this option. If the effect is too strong, select **Bicubic Automatic** or **Bicubic**.

Output sharpening

For printed images, this type of sharpening is a must. For images going to the web or to show on a computer screen, sharpening will have minimal impact. You can avoid most screen sharpening unless you are upsizing your images for some reason.

Output sharpening is intended to offset the softness created when the ink is applied to a substrate. Depending on the printer, ink, substrate, temperature, humidity, and other factors, there can be noticeable softness caused from the ink hitting the paper. This softness makes the image appear softer and maybe even slightly out of focus as compared to what we see on screen. Output sharpening is used to offset the ink spread so that the printed image looks as it is expected to look.

A number of factors go into the amount of sharpness to apply for output sharpening. The type of ink and printer are important, but the substrate type is arguably more important. The substrate will also have a significant impact in the amount of sharpening that needs to be applied. For example, you need more sharpening for matte papers than for glossy papers. Matte papers absorb more ink, and the ink spreads out, creating a softer-looking print. Glossy and luster papers hold the ink on the surface of the paper more than matte paper, and therefore do not require as much sharpening. Additionally, the viewing distance and size of the print make a difference in the level of sharpening that needs to be applied.

Output sharpening should be applied at the very end of the process. The image needs to be at the final print size when you apply the output sharpening. Unlike when viewing creative and capture sharpening, it is best to judge the effects of output sharpening is at a 50% magnification level. If you are zoomed in to 100%, then the impact will seem to be too aggressive even though the proper techniques have been applied.

Because there are a number of techniques for output sharpening and so many variables, extensive testing is required if you are going to try and sharpen without the use of a third-party solution.

Most output sharpening is a combination of **High Pass filtering**, **Unsharp Masking** or **Smart Sharpening**. The goal is to use these options to etch the edges of your images so that when printed, they look like they do on screen. If I am doing sharpening by hand in Photoshop, I sharpen and use the **Blend If** options to separate and target the lighter edges and the darker edges, separately.

In most cases, what I recommend for output sharpening is a third-party plugin or action. Tools such as PK Sharpener, Sharpener from Google Nik, or even the Lightroom print engine all have sharpening engines that take into account the paper, viewing distance, print size, and printer settings to properly calculate the amount of sharpening. It is a huge time and cost saver not having to test and retest your output sharpening settings.

Soft proofing

At night, photographers dream of a world in which their prints will appear the same on paper as what they see on the computer screen. Even though we know that will never be 100 percent true, we still work hard to make sure that our prints match as close as possible. To get everything to match, you must have a properly calibrated workflow. You need to have your monitor calibrated and a proper profile for the substrate that you are printing. Soft proofing uses the ICC profiles and attempts to simulate what you will see

when you print your image. This on-screen rendering of your print can show you where you might have issues to consider correcting before you print.

Common issues

Saturation issues are one of the most common issues when soft proofing. Saturation issues can sometimes be fixed by a change in rendering intent. When changing intents, you want to look at the way the colors shift when switching between the relative and perceptual rendering intents. Often you will see blues shift toward a green or reds will become orange. If the saturation is higher than you can correct with a rendering intent change without a shift, you will need to tweak the colors so that they still work for your image by using a **Hue/Saturation** adjustment layer specific to the paper output or by changing the hue slightly.

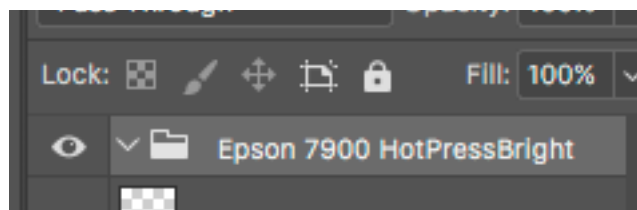
It is important to know that the in-gamut and out-of-gamut display is not completely accurate: it is an approximate assessment. It also doesn't show you the shifts in the in-gamut colors based on the rendering intent. The soft proof will help you prepare for what you might see when printing high saturation images, but you will be making your final saturation corrections from a proof print.

Contrast is the other area that has the most change when printing. When you create a soft proof, you will normally see a decrease in contrast when printing, particularly on matte papers. When you see a drop in contrast, you can increase the contrast of your image to offset the flatness being introduced by the paper choice. Do not adjust your white and black points to deal with contrast: those were already set when you edited the initial image. If the image looks flat, make your contrast adjustment in the mid tones by using a **Curves** or **Levels** adjustment layer.

Soft proofing in Photoshop

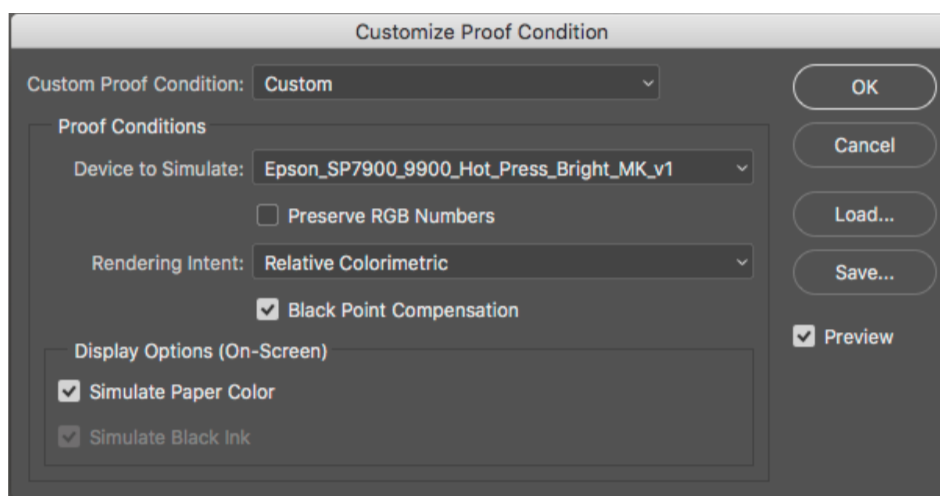
When working with soft proofing, I like to start with a trick that John Paul Caponigro taught me. It is really simple but makes a huge difference in getting to work with the process. When you are ready to soft proof your image, go to the **Edit** menu, and select **Duplicate**. Then, tile your images side by side. This setup will let you see the original vision of the image that you are attempting to print and the effects caused by the paper, rendering intent, and printer.

In the original image, create a **Group** and title that group the name of the paper and printer that you are printing with.



You are going to put all the output-specific edits to the image in this group. This allows you to turn the output options on and off. It also allows you to have the image be printable to multiple papers without having to create duplicate files.

Once you have the group created, select your main image, and under the **View** menu, select **Proof Setup**. This will open the **Customize Proof Condition** dialog box.



The first thing you will want to do is to make sure that you have the **Preview** box selected. This will let you see the effects of some of the options that we are going to set in real time.

In the **Proof Conditions** section, select the proper profile under **Device to Simulate**. In this case, I selected **Epson_SP7900_9900_Hot_Press_Bright_MK_v1** for the Hot Press Bright Paper that I am going to print. Your selection can be any profile you have installed. So even if you want to simulate sRGB, because you are going to publish an image on your website, you can select that as an option. It doesn't have to be a paper profile.

You should also make sure there is a check in the checkbox next to **Black Point Compensation** and next to **Simulate Paper Color**.

Black Point Compensation is used to help show the impact of the paper's ability to render black at a given value. Some papers can render more details in the blacks than others. For example, say one paper can render black at a value of 5 but a different paper can only render starting at 14. The compensation option attempts to show you the effect of that difference so that you can adjust the contrast and shadows values accordingly.

Rendering intent

You can now select the various rendering intents and see the impacts they can have on the image. Depending on your color saturation and gamut, you might not see much difference, but in some cases it can be dramatic. Also, soft proofing doesn't always show how the colors in gamut might shift based the rendering intent.

The rendering intent should be selected based on the content of the image rather than always selecting one option over the other. In general, for black and white images, and images with mostly in-gamut colors or less saturated colors, I select **Relative**. If an image has highly saturated colors or the color value and their relationships are critical, I would expect to lean toward **Perceptual**.

Image correction

With soft proofing turned on (Toggle **Soft Proofing** on and off from the **View** menu or use Command+Y on a Mac or CTRL+Y on a PC), you want to start to make adjustments to your image.

In most cases, you will want to create a **Hue/Saturation Adjustment Layer**, a **Curves** adjustment layer and maybe a **Levels** adjustment. The goal is to use these adjustments to make the image with the soft proofing active look as close as possible to the original image in the second window. These adjustment layers are put into the group created earlier so that all the adjustments can be turned on and off with a single click. It also helps ensure these correction adjustments are only applied to the proper paper/printer type.

Once the images look close to each other in terms of color, contrast, and saturation, it is time to make a print. It is important to remember that with the output-specific adjustment applied, your image will not look "correct" on screen if soft proofing is off. That's ok: your adjustments were to get the printed paper to look correct. Also, if you have more than one output-specific group, make sure that only one group is active.

After the print is done, you will need to make any additional corrections to the output adjustments and print again until you are happy. In most cases, the adjustments that you make for one image can be applied to a different image using the same paper. There will likely be some slight tweaks based on the image content, but they will be really close to the settings because the adjustments are paper- and profile-dependent.

Making the print

Before you start

Before you start printing, there are number of things that you want to check before you click **Print**:

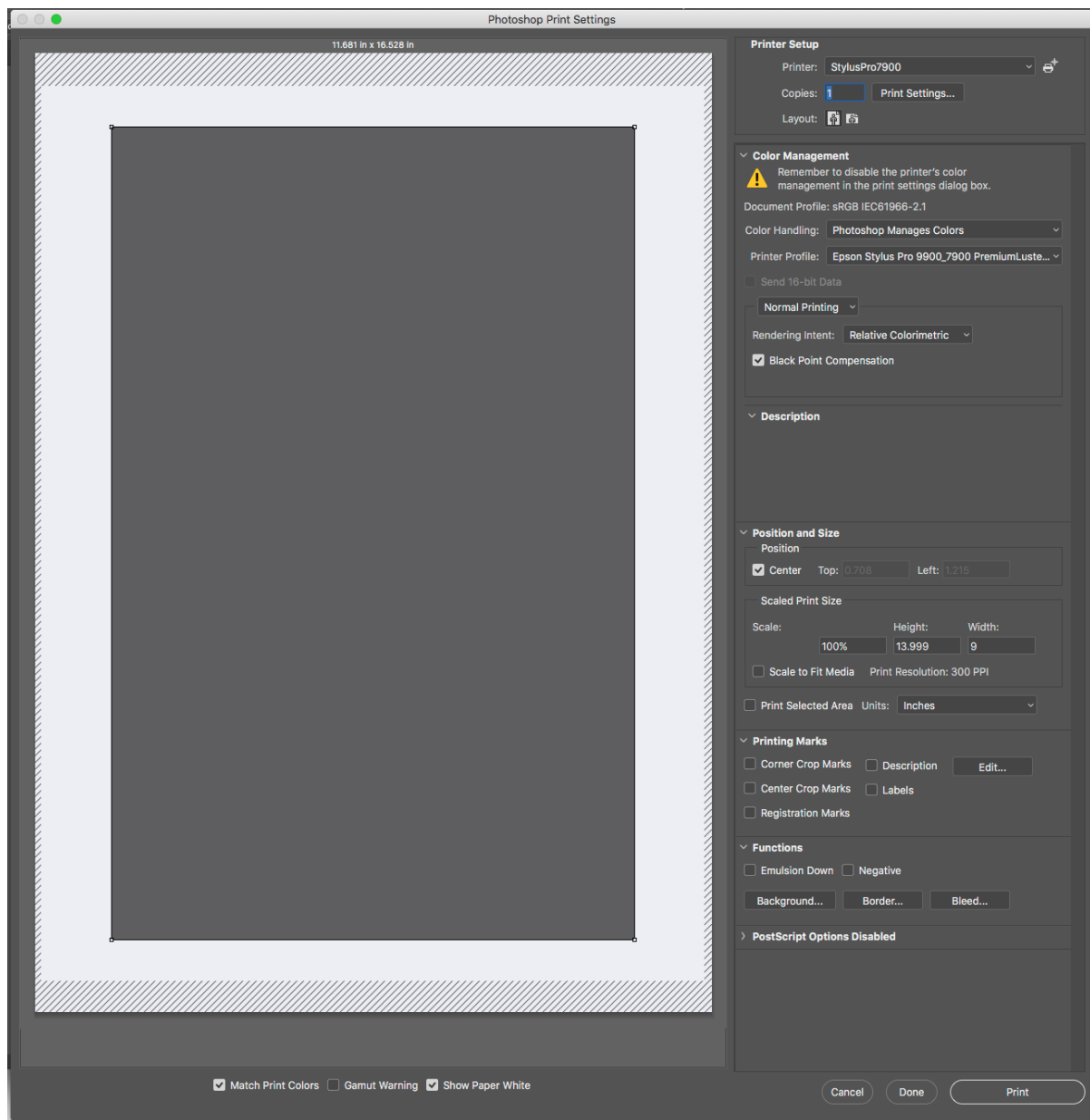
1. Do you have the correct paper to print with?
2. Do you have the latest version of the printer driver installed?
3. Do you have the correct ICC profile for your paper and printer installed?
4. Have you calibrated your monitor recently?
5. Print and image considerations:
 - a. Clean-up issues (dust spots, horizon line, etc.)
 - b. Crop is correct
 - c. Noise reduction and sharpening is done
 - d. Global, regional, and local adjustments have been made
 - e. Corrected luminosity first, followed by hue, and then saturation
 - f. Non-destructive layer setup is intact
 - g. Image resolution is acceptable
 - h. File is properly sized
 - i. Output sharpening is good
 - j. Soft proofing adjustment done and turned on
 - k. Completed final check of image to make sure nothing is missed and make sure that no artifacts have been introduced
6. Have you soft proofed the file?
7. Within the printer:
 - a. Proper ink type is set (matte or glossy)
 - b. Proper paper type is set (paper type and roll verse sheet)
 - c. Nozzles have been checked and are unclogged
 - d. Printer is connected to computer or network

Photoshop print dialog box

When printing in Photoshop there are many settings that you want to check in your Print Dialog Box to ensure a proper print job.

Printer Setup panel

This section is used to set up the printer-specific options for your printer. Select the printer that you want to print to from the **Printer** menu. Then, click **Print Settings**. This will open the **Print Settings** dialog box where you can set up the options for paper sizes, paper types, and other printer-specific options.



Color Management panel

This panel is used to configure the color management for your print. If you are using an ICC profile for your paper and printer combination, you want to select **Photoshop Manages Color**. From the **Printer Profile** menu, select your profile from the list. The list will be long, because it has every ICC profile installed on your computer. You might have to scroll and hunt around to find your profile. Also, printer profiles don't always have the friendliest names, so you might need to refer to the documentation that came with your profile to find the name. If you don't have an ICC profile or you want to print using the printer color engine, select **Printer Manages Color**.

If you are printing black and white on an Epson printer, then I recommend that you select **Printer Manages Color** and use the **Epson Advanced Black and White** options to get the benefits of that black and white print engine. If you are using a Canon printer and printing black and white, then I recommend that you select **Printer Manages Color** and use the **Canon Monochrome Photo** option in their driver.

If you have the option to send 16-bit data, select that option. Not all printers support 16-bit, so you might not have that option. You also have an option to select **Normal Printing** or **Hard Proofing**. For most photographers, selecting **Normal Printing** is appropriate.

Next is selection the **Rendering Intent**. You must select the rendering intent that you used when you soft proofed. If you didn't soft proof, I would start with **Relative Colormetric** and do a proof print. Always make sure that you check the **Black Point Compensation** box so that you get the remapped black values for your paper.

Description panel

This is where your tool tips appear when you mouse over areas of the **Print** dialog box. Sometimes these can be really useful in helping you understand various options. Other times, they are complex enough to cause nothing but frustration, and you can either ignore them or, if you're so inclined, seek translation help from an engineer.

Position and Size panel

This panel is used to center the image or make adjustments to where the image appears on the printed page. In some cases, selecting center doesn't always center the image because of printer settings that are overriding these options. There is also an option **Scale to Fit Media**, to resample and resize the image here, but I would do any resizing with the **Image Resize** option outside the **Print** dialog box and back in Photoshop.

Printing Marks panel

This panel is used to turn on various options for adding print marks to the print. They are normally used for design work and not often used in photographic prints.

Functions panel

The panel is used for specific alterations of the image; again, mostly for specialized printing or design work.

Postscript panel

If you are printing to a postscript printer, then there are a number of options specific to postscript printing that will appear here. Most inkjet printers used for photography are not postscript printers.

Once you have set your settings—again the color management section being the most important—then you can click **Print**.

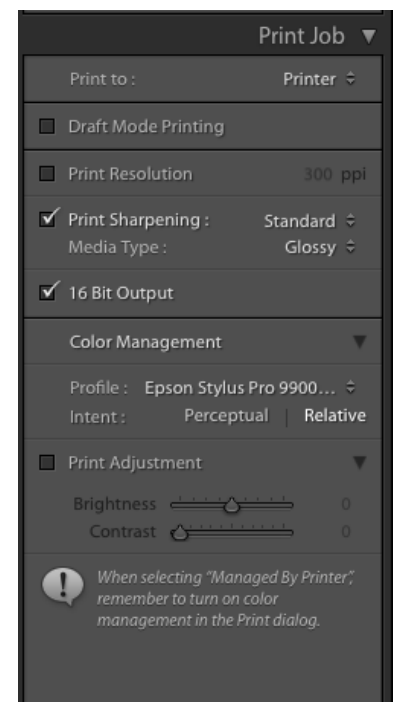
Sometimes you might get errors at the printer or in Photoshop when printing about print mismatches. These are often caused by the incorrect options being set in the **Printer Settings** and in Photoshop. For example, you select a matte paper in Photoshop but the printer has glossy paper installed, or you have roll paper installed and you tell the **Printer Settings** that it is sheet paper.

Lightroom printing

Although the focus of this document is Photoshop printing, Lightroom has an amazing print engine. It can batch print, output sharpen, resize, resample, and apply proper color profiles. I have found that Lightroom is a powerful and productive printing tool. It really can make the printing process a much simpler process. I still do my soft proofing and final tweaks in Photoshop, but now often I print out of Lightroom.

Printing with a RIP

You can also print using something called a RIP (Raster Image Processor). For some printing applications and prints, the use of a RIP can offer control in the print that isn't available in the print driver. There are also a number of RIPs that can enhance black and white printing. The software allows you to print outside of Photoshop or with a plugin and apply a number of custom curves to your images that can result in subtle shifts to the look, quality, and feel of your black and white prints. Not all printers support printing with a RIP, but it is an option to look at if you are interested in pushing the printing a different direction. One of the most popular for Epson printers is [Quadtone RIP](#) by Roy Harrington.



Judging the work

It is important to objectively look at the print when you get it off the printer. A good print has a full range of tones, textures, and color values. If you are not happy with the print, spend some time and figure out why. What exactly is wrong with the print? Whatever the issue, spend the time to really look at the print and make notes of all the things to correct in the next revision. You will be surprised at what you see in the print that you never saw on the screen. The same thing will happen when you start to print bigger. Issues in a small print might not show up until you see them printed at a larger scale.

After you have your list of issues that you want to correct, sit back down at the computer, make those adjustments, and then make another print. Next, place both photos onto your viewing wall. Did the changes you make improve the photograph or make it worse? We often need to be able to compare two prints to know if we are actually making progress. It's not uncommon to need to make several prints to get a final print completed. Don't be surprised if you need to make 10 to 15 prints or more when you first get started. As you get better at seeing issues ahead of time, get better at printing, and get better at correcting prints, the number of prints from first print to final print will decrease.

One of the questions I get asked a lot when helping people print is how do you know that the colors, tones, and textures are right? Isn't that just to taste? On one level that is true. But when we look at a photographic print, there are certain standards we use to judge the image:

1. Does the print have a strange color cast across the image? We talked about the viewing lights for judging a print and if the print looks too warm or cold in the proper viewing conditions. That would be something to correct.
2. Are the shadows and highlight missing details and appearing as black areas or white areas? If so, and they are not part of the composition or story, we would want to correct those as well.
3. We also look for strange artifacts caused by over sharpening, filters, etc. If we can see those artifacts, then we would want to correct for those effects, too.

So yes, part of the quality of the image is taste, but we have all seen poorly printed photographs, so on some level you want to make sure that your prints don't end up in the wrong bucket.

Also, printing is a skill just like taking a photograph is a skill. It requires practice, patience, and dedication. So don't feel discouraged as you get started. The more you print the better you will become as a printer and photographer.

Finalizing the print

It is important to take care of your prints. Even proof prints should be carefully stored so they don't get damaged. I store all my loose prints in archival print storage boxes. You can get these boxes in a number of sizes and from a number of vendors. The key is to make sure that they are archival quality. I personally like the Century Boxes or the storage boxes from Archival Methods.

Signing the print

It is important to sign your prints. Most collectors will expect that the print is signed. I don't sign inside the image but that is a personal choice. For my printing style and aesthetic, I like to have my signature not interrupt the frame or content of the photograph.

Your signature should be consistent from image to image, and it takes practice to get used to signing prints. Since you will be using both pens and pencils, it is worth practicing with both to get that signature down before you start to sign the final prints.

For signing matte or watercolor papers, I use a pencil. For other types of paper, the pencil won't properly adhere to the surface, so you need to use ink. I use the Sakura Micron pigment-based pens from Pigma. These pens are both permanent and archival. Not all pens are archival. Permanent is not archival. Since I have gone to all the trouble to make an archival print, I want to make sure that the signature is archival as well. I also make sure that I select a pen that won't bleed through the paper.

The most common place to sign a print is on the lower left or right corners of the front of print in the margin area (en recto); however, you can sign the back of the print (en verso) if you prefer.

Most images are also numbered indicating the number of times the print has been printed or sold. If they are limited editions, the number of that particular print appears above the number of prints in the edition.

I also find it important to include creation and meta information about the print. This includes the print date, image date, paper, printer, inkset, and other considerations for

the print collector. This can help in the event that the print needs to be reprinted in the future or restored due to damage. I include this on the back of the print or mat board so that it doesn't distract from the print. If you frame the print, I also include this on the frame backing paper so they don't have to take the frame apart to find it.

Matting and framing

Matting and framing really makes a photograph feel like something valuable. There is a completion and sense of accomplishment when you truly finish an image with a mat and frame.

There are a number of ways to mat and frame an image. If you are unsure about matting options and what you might want, find a local framing shop and spend some time with them to learn how to think about matting, mat colors, frames, and how they impact our appreciation and understanding of the work. I eventually purchased a mat cutter for the studio, and I cut a lot of my own mats these days, but most people prefer to purchase already cut mats. Either way, make sure that you are using archival products with the work. So make sure that you select mat boards that are archival and framing supplies that will also help maintain the quality of the image.

When matting, you want to have the bottom border of the mat a little wider than the top border. If you make the top and bottom even, we will perceive the image to be mounted lower in the frame. The offset at the bottom will help ensure that your image appears in the middle. On smaller images, a quarter of an inch is good. Increase the amount as the print size increases.

While there is no rule on how thick a mat should be, the following table can provide a starting point. The Logan company also has numerous guides on their site to help determine matting options.

Image Size	Border Size
6x9	1 3/4"
11x14	2"
11x17	2 1/2"
13x19	2 3/4" - 3"
17x22	3" - 3 1/2"

Spray coatings

There several products that you can spray on your images to help further protect them from UV damage and damage caused by oils from human hands. After you have completed the final print, signed the print, and made any annotations, then you can apply the spray to the print. Most of these products are a form of aerosol varnish. You want to sort of spray over the top of the print and let the varnish fall onto the print. It is better to make two or three very light coatings, allowing the coating to dry between coats, than to spray too thick of coating onto the print.

Hahnemule makes a nice spray, as does Moab. John Paul Caponigro uses Premier Print Shield, which is also a great product. I have tried all three, and other than the very strong smell, I felt they were all equally good, but the Premier and Hahnemule products did seem, to my eye, to have little impact on the paper quality and look.

Issues to watch for when printing

- Print is too dark—Monitor is too bright, recalibrate.
- Print is too dark and green—No color management.
- Print is too light and magenta or purple looking—Photoshop/Lightroom and the printer are all applying color management.
- Print looks really bad—No calibrated workflow or wrong ICC print profile selected.
- Blacks look dull—Wrong ink in printer or wrong ICC profile.