



## Introduction

Have you printed your images and felt they lacked a little extra punch? Have you worked on your images only to find that you have created strange little halos and lines, but you're not sure where they came from? Have you felt lost in a sea of information about sharpening? At times, it can seem overwhelming trying to sort out the when, how, and why to sharpen your images. And while there is a ton of information out there about sharpening, the information often seems to conflict. When faced with questions like— When do you sharpen? What magnification do you use? Does the size of the image matter? Does the printer make a difference?—it can often leave you wondering: Where do I begin?

The reality is that the majority of photographic images can benefit from some form of sharpening. Even if you are working with some of the newer high-resolution sensor cameras or cameras without anti-aliasing filters, your images can still be improved with some level of sharpening.

Most sharpening workflows today find their roots in Bruce Fraser's and Jeff Schewe's book *Real World Sharpening*. In their book, they define a foundation that is used in some form or fashion in nearly all sharpening workflows. If you haven't read that book, I suggest you check out a copy. They do an excellent job of teaching you the nuts and bolts of sharpening, why it works, and how to apply it. For the most part, their concepts are for use in Photoshop, and

thanks to Adobe, much of that work has been simplified in Lightroom. However, it is still a useful resource for understanding the ins and outs of sharpening.

Their basic workflow concepts can be found in the various tools and modules within Lightroom. The basic workflow breaks sharpening down into three key areas: capture sharpening, creative sharpening, and output sharpening. Although there are only three types of sharpening, the purpose, implementation, and tools for these strategies are quite varied. Luckily, the tools in Lightroom simplify the process and allow you to work quickly and efficiently.

## **Sharpening and In-Camera Concerns**

I think it is important to start off knowing that sharpening is not a replacement for proper camera technique. Sharpening will not make an out-of-focus image sharp. Sharpening has no impact on depth of field, camera shake, or general softness. When working with any image, you want to start off with the best capture possible. Remember to use proper hand-holding techniques, watch your shutter speeds, and use a tripod if necessary. If shooting long exposures, use the mirror-up feature on your camera to minimize camera shake. Your goal is to have the sharpest image possible right out of the camera.

## **Sharpening Concerns**

Regardless of the type of sharpening, you want to avoid the introduction of any unwanted or unexpected artifacts into your file. As you sharpen your images, you can quickly create a number of issues. Key things to watch for include:

- introduction of noise
- light or dark halos
- dark lines around edges
- light lines around edges
- hyperreal textures and edges
- loss of detail in highlights and shadows (noise reduction)
- color bleeding or color shifting

It is also important to note that as you increase your print size, these artifacts may become even more pronounced. You will want to check for any of these issues any time you make any adjustments to your print size or output resolution.

# Noise Reduction

Noise is a result of the digital sensor capture process. The amount of noise generated depends on several factors including pixel size (larger pixels create less noise), exposure settings, and image content. Noise is also more pronounced in the darker parts of an image because the brighter parts of an image have a higher signal-to-noise ratio.

Noise is a combination of two elements: luminance and chroma. Luminance noise is grayscale. This type of noise has an impact on the brightness values of the pixels but has no real impact on the color. This type of noise is analogous to film grain. If you haven't ever seen film grain, it sort of looks like old television static across the image.

Chroma noise shows up as various odd and random colored pixels scattered across the image. In many cases, the pixels appear as red/magenta and green. I often think of them as holiday lights. Chroma noise often looks worse, and can render an image unusable, because of the color contamination.

Because there are a number of factors that impact how visible noise might be in your image, you may need to use noise reduction software to remove the unwanted artifacts. In most cases, on modern cameras, images shot at 800, 1600, and higher ISOs will need some form of noise reduction. Your goal is to remove as much of the noise as possible while still preserving the details in the image and avoid any unwanted color shifts or artifacts. The amount of noise and the ratio of luminance and chroma can vary from camera to camera and setting to setting.

Noise reduction is the result of slightly blurring areas of the image. In some cases, noise helps with the perceived sharpness within an image. There are some instances where you might introduce noise to increase perceived sharpness. It is important to keep both factors in mind as you start to work on your noise reduction strategy.

When an image has significant levels of noise, it is almost impossible to remove all the noise and still preserve sufficient details or avoid a synthetic looking image. As good as modern software is at dealing with noise and leaving the image in a good working condition, in most cases you will not be able to remove all the noise without introducing some level of unwanted artifact (loss of detail being the most common).

As you develop your overall workflow, you should apply noise reduction before applying any type of sharpening to have the right balance between noise reduction and sharpening.

## Lightroom Noise Reduction

The noise reduction tools in Lightroom can be found under the Detail panel in the Develop module. Noise reduction is used to remove the two types of noise.

When working on noise removal, I recommend that you view the image at a 1:1 ratio (100%) so that you can see the impact of the noise removal process. It is important not to be overly aggressive in the removal of the noise so that you can preserve an appropriate level of detail in the image. After you think you have the appropriate level, it is important to check over the other parts of your image to ensure that you didn't inadvertently create a negative impact in other parts of the photograph.

To start your noise reduction, from the Navigation panel, zoom in on the image at 1:1 (100% magnification) and open the Detail panel in the Develop module.



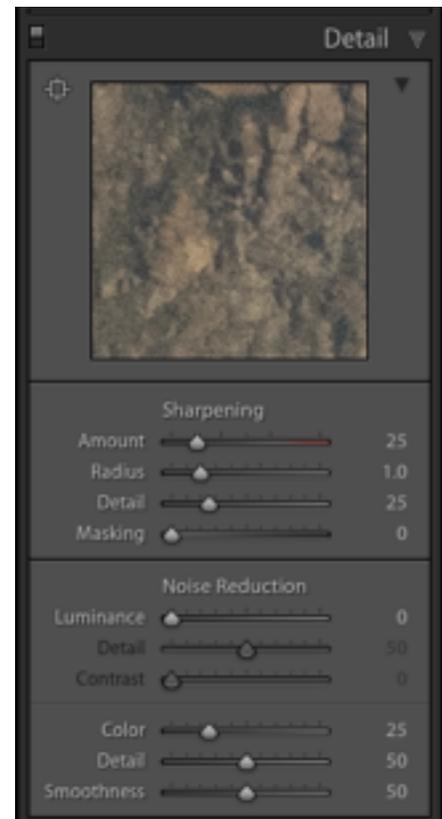
If you have any chroma noise, you will want to start by removing it first.

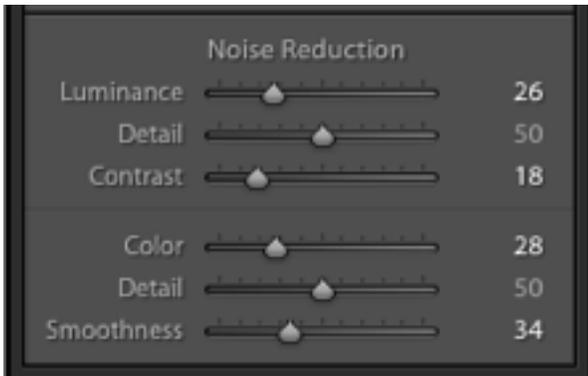
Although it doesn't necessarily matter which you remove first, chroma noise is often easier to remove and less destructive to the file.

In the Details panel, move the **Color** slider to the right until you are at the point where the color noise is removed. If you need to refine your edit, use the **Color Detail** slider to set the threshold for noise levels. The higher the value, the more details that are protected, but you might see more speckled

colors. The lower the number, the more colored speckles will be removed, but colors can cross contaminate. Somewhere toward the middle is often a good place to start. The smoothness slider can be used to smooth out color shifts, particularly in low-frequency areas of an image.

After you have tackled the chroma noise, you can move on to dealing with the luminance noise. Move the **Luminance** slider to the right to reduce the levels of noise in the image. You might often need to adjust the other two sliders under Luminance as well. Luminance Detail controls the detail preservation in the image. The higher the value, the more details get saved,





but it also leaves in more noise. The lower the value, the fewer details are preserved, but the noise is more strongly reduced.

Luminance Contrast is used to help preserve the overall contrast that might be lost from the reduction in noise. The higher the value, the more contrast is saved. But, you leave in more noise and increase the risk of producing artifacts. The lower

the value, the less noise, and the smoother the transitions become, but the image might also suffer from a loss of detail and color.

You can hold down the **ALT** (PC) or **Option** (Mac) modifier key when using the Detail and Contrast sliders, and the image will turn grayscale, allowing you to focus on just the impact of the noise reduction and not be distracted by the color information.

You can also use the adjustment brush and do selective noise reduction on a part of an image if you don't feel that you need to apply noise reduction to the entire image.

## Capture Sharpening

Regardless of your camera type, capture sharpening is something that can benefit most images. The purpose of capture sharpening is to offset any optical or digital softness created by the capture process. Although some new cameras don't have anti-aliasing filters, there are still some issues created by the lens/sensor combinations where capture sharpening can be a benefit.

For many camera and lens combinations, you might find that you have to vary your sharpening based on f/stop and shutter speed combinations. You might also have some lenses that require a different level of sharpening.

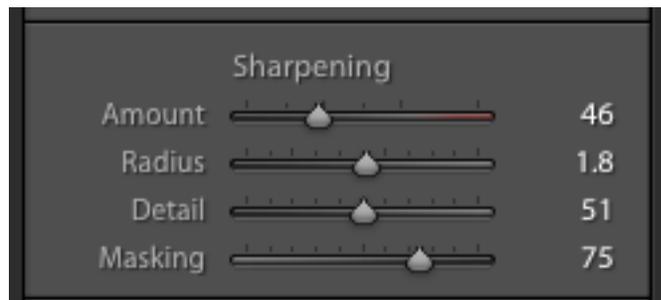
As you begin to work with your images, you will be able to develop a pretty consistent process and settings to be applied to your various camera/lens/ISO combinations. Things such as long-exposures, noise reduction, high or low-frequency images, etc. will often impact the amount of sharpening needed. After you are comfortable with the types of sharpening that you might apply to a type of image and camera combination, you can build a preset to get your basic settings applied when starting on an image.

It is tempting always to apply the same level of sharpening, but subtle adjustments to your baseline settings might have a greater impact than expected. You should always review your capture sharpening settings when working with any image.

Normally, capture sharpening is done at a global level across the image and is best applied during the Raw file conversion process. When editing an image in Lightroom, you want to view the screen at a 1:1 ratio (100% magnification) so that you can see the impacts of the sharpening in the image.

When working with capture sharpening, it is best to follow the adage that *less is more*. It is easy to apply too much sharpening at this point, and after you do further edits on your file, the sharpening artifacts can become very pronounced. You can always use creative sharpening techniques to selectively increase sharpness in certain areas of your image rather than risk causing issues to an image.

Capture sharpening in Lightroom is under the Detail module. In the Sharpening area of the Detail panel, you will find the four sliders that control the global sharpening of your image. Amount is the primary slider for controlling sharpness and the Detail, Contrast, and Masking sliders are used to refine the sharpening.



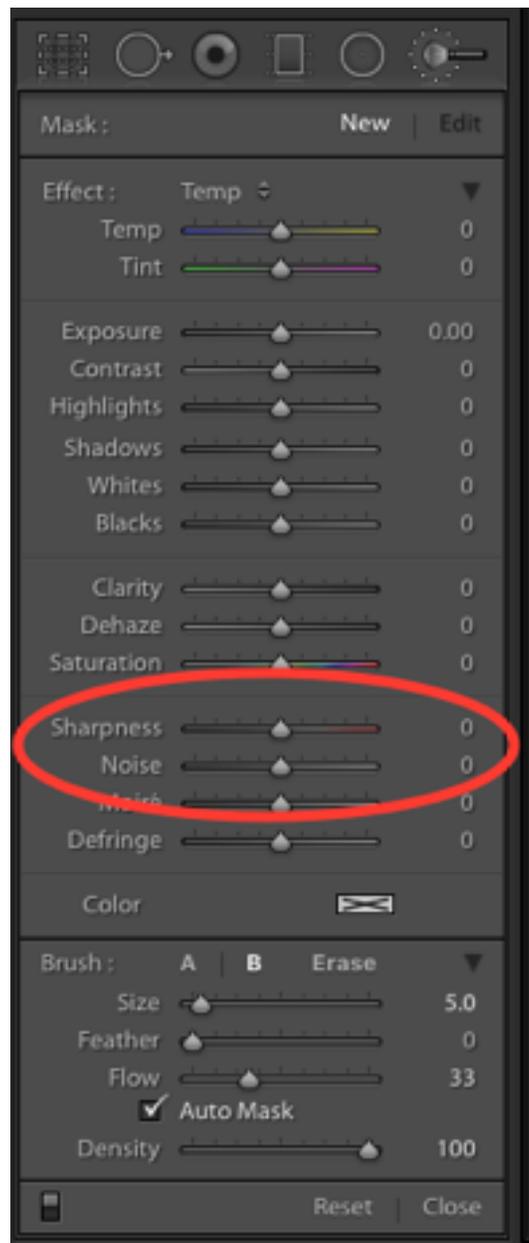
The Amount slider controls the amount of sharpness you want to apply to an image by increasing the micro contrast between the pixels. It works by making the bright side of an edge brighter and the dark side darker. The scale is from zero to 150. Zero means no sharpening is applied, and 150 is the maximum amount of sharpening. If you move the slider to the right, you apply more sharpening, and to the left you, add less sharpening. There is no right number, but, in general, you will be on the mid to lower end of the scale.

The Radius slider is used to determine how far from the pixel the sharpening effect should begin. The scale is a radius of 0.5 pixels to 3.0 pixels wide. A setting of 2.0 would mean that brightening and darkening extend out 2 pixels from the edge. For most photographs the lower the number, the less likely to create unwanted artifacts. Most people use values in the 0.6 - 1.2 range. High-frequency images having a lower number and low-frequency images have a

higher number. Using the Alt (PC) or Option (Mac) key will show you a grayscale version of your image that reveals the edges having the levels of sharpening applied so that you can see the impact of the adjustments. Areas that are impacted are well-defined edges of various levels, while areas not impacted remain neutral gray.

The Detail slider is even more of a finely tuned adjustment. It impacts more on the highly textured areas of an image (high-frequency areas of an image). The lower the number, the less sharpening, and the higher the number, the smaller edge details get more sharpened. It is important to watch for the introduction of noise when pushing this slider too far to the right. Again, like with most sharpening, it is better to be conservative when making your adjustments. Using the Alt (PC) or Option (Mac) key will show you a grayscale version of your image that reveals the high-frequency edges so that you can see the impact of the adjustments.

The Masking slider is used to create an on-the-fly mask to select where and the amount of sharpening you are applying in the image. When you move the slider to the left, you will start to remove the low frequency data from the sharpening and leaving only the more pronounced edges to be sharpened. Using the Alt (PC) or Option (Mac) key will show you a white/black mask of what is being sharpened. Areas in white are having sharpening applied, while the areas in black are masked from having any of the sharpening settings applied. I love this feature when working with skin, skies, and soft gradients.



## Creative Sharpening

Of all the stages of sharpening, creative sharpening can have the most impact on an image. The goal of creative sharpening is to create a specific look, feel, or mood or to enhance a specific part of an image. Our eyes are drawn to sharper parts of a photograph before less

sharp areas. Creative sharpening can help you subtly impact your photographs and help lead a viewer's eye through the frame. (You could also use the opposite and selectively blur parts of an image to achieve similar results).

Not all images require creative sharpening, and creative sharpening's use is mostly subjective. It is still important to avoid the creation of any digital artifacts, but the tools, application, and amount of sharpening are truly at the creative desires of the photographer.

Just like with global sharpening, creative sharpening should be viewed at a 1:1 ratio (100% magnification) so that you can properly judge the impact. Creative sharpening in Lightroom is done with the adjustment brush. I recommend that you make your creative sharpening adjustments without any other settings being applied. Although an adjustment brush may contain many adjustments options in a single pin, depending on your output size and resizing needs, you might need to make adjustments to your sharpening. Having only to correct the one setting will save you considerable time in your workflow.

You can also selectively introduce some noise to parts of an image and boost the appearance of sharpness as well. This is a useful technique when using sharpness alone might create undesired results.

## **Output Sharpening**

Output sharpening is of huge benefit for printed images. I would say that 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 dot gain from the ink hitting the paper. This dot gain makes the images appear soft and maybe even slightly out of focus. Output sharpening is used to offset the dot gain 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 is important, but the substrate is arguably more important. Depending on your printing medium, you can have significant changes in the amount of sharpening that needs to be applied. For example, you need more sharpening for matte 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.

When working in Photoshop, you set your output sharpening at the very end after making all edits, making output-specific adjustments, and selecting your medium. Unlike when viewing creative and capture sharpening, it is best to see the impact of output sharpening at 50% magnification.

Luckily with Lightroom, most of that work has been done for us. Adobe partnered with Jeff Schewe, and the team that built Photo Kit Sharpener for Photoshop, to create the output sharpening in the Print module. They figured out all the work—based on your print size, substrate, printer, and viewing distance—how much sharpening to apply to the image. The Print module then applies the appropriate levels of high- and low-frequency sharpening and sends the image off to the printer.

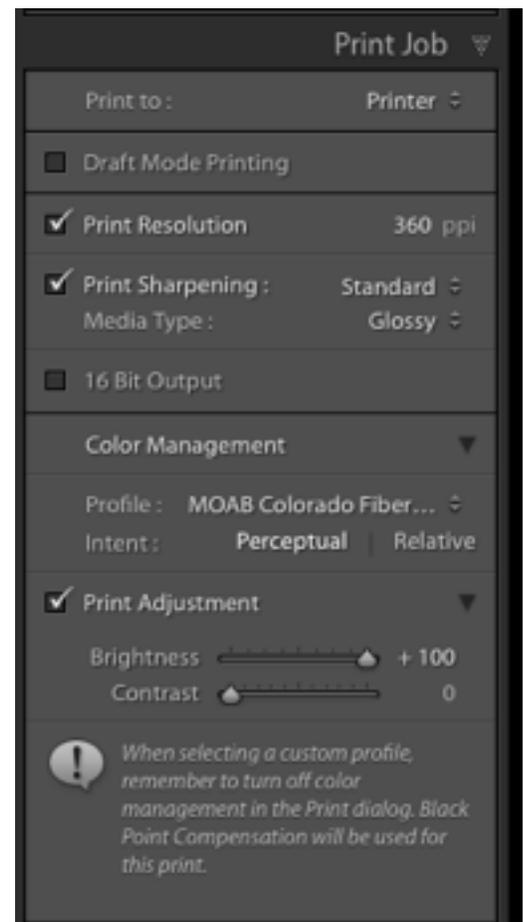
The work that they did takes most of the brain power out of output sharpening in Lightroom. It is one of the reasons that I like printing out of Lightroom so much. The only things that you need to know are what type of paper are you printing on and how much sharpening you want applied.

There is no right answer for the amount of sharpening to select without some testing. Certain papers hold details better than other papers. Certain images need different levels. You will need to do some testing to see what level is appropriate for you.

In my work with images that have low-frequency data or subtle gradients, I select the Low option. Conversely, when I have images with high-frequency details, I might select the High setting just to make sure that I get all the detail possible in the print.

Your assessment is the most important factor in determining the output sharpening levels. Make a print, and check it. Look closely at it to make sure that there are no issues or unwanted artifacts that have been introduced by the printing process. If there are, you need to make the necessary adjustments and print again. Most issues introduced by output sharpening can be fixed by selecting a lower level of sharpening from the Print Job panel.

Output sharpening settings in Lightroom are found under the Print Job panel in the Print module.



To activate print sharpening, check the box next to Print Sharpening. Select your level of sharpening (Low, Standard, High) and select your Media Type (Glossy or Matte). That is all there is to it.

## **Third-Party Tools**

If you need to work on an image and feel that the type of noise reduction or sharpening just isn't right when using the Lightroom tools, there are a number of third-party tools that can be used for sharpening and noise reduction.

Here is a short list I have tried and found useful.

### **Sharpening**

- Pixel Genius' Photokit Sharpener (works in Photoshop)

- Sharpener Pro from Google's Nik software suite

- Techniques and options in Photoshop (unsharp mask, high pass, etc.)

### **Noise Reduction**

- Dfine from Google's Nik software suite

- Noise Ninja

- Noiseware from Imagenomics (my preferred tool—Photoshop or stand-alone only)

- Several techniques in Photoshop