

"THE IMPORTANCE OF SHARPENING IMAGE FILES" BY MICHAEL SMYTH

This tutorial demonstrates the recommended workflow and techniques for applying sharpening to RAW files. We explain why all files need at least some sharpening as well as when and how to apply sharpening. Many users seem unaware of the need and importance of applying sharpening to their files, or apply the wrong type of sharpening at the wrong place in the workflow.

These notes should be read in conjunction with our notes on RAW processing in Adobe Lightroom or Adobe Camera RAW.

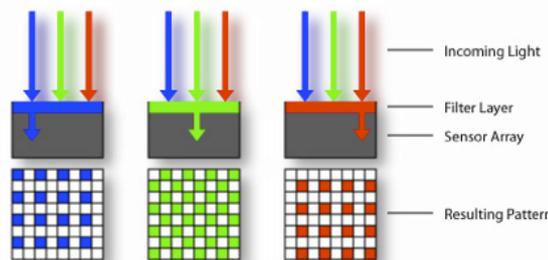
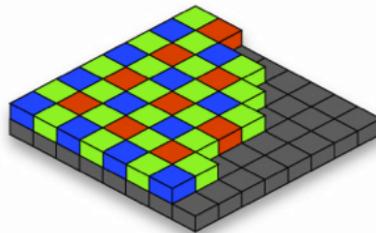
INTRODUCTION – WHY DO WE NEED TO SHARPEN ?

The fundamental reason we need to apply sharpening to all RAW files is that there is some softness that is introduced to the image data as a result of the capture mechanism (Anti Aliasing Filter) and the way the image data is transformed from a collection of Red, Green or Blue Pixels into a full RGB image, where each pixel (*PI*cture *EL*ement) has a value for R, G and B. This is known as the ***Demosiacing Algorithm***

Color Sensing: Bayer Grid



Estimate RGB at each cell from neighboring values



Slide by Steve Seitz

Left: The most common digital sensors use a "Bayer" pattern sensor, where each pixel captures only Red, Green or Blue light. Note that there are twice as many Green sensors as Red or Blue.

As part of the Demosaicing process, some softness at the boundaries of colours are introduced.

http://en.wikipedia.org/wiki/Bayer_filter

All RAW files will need some amount of sharpening applied as part of the processing of the image data into an image file.

Anti-Aliasing Filters (AA Filters) are no longer fitted to most newer digital cameras that have high resolution sensors, something like 24 mega pixels (24 million pixels – typically something like 6000 x 4000 pixels), however many older cameras have an AA filter that increase the softness of the image slightly. This was designed to avoid "jaggies" appearing at the edges of image elements running at angles to the pixel rows, as well as avoiding moiré effects where highly textured parts of an image take on false patterns, often associated with rainbow colours.

With higher resolution sensors, both of these effects are minimised, and the AA filters have largely been abandoned.

WHAT IS SHARPENING AND WHAT DOES IT DO ?

Applying sharpening to an image file cannot add focus to an image that has not been correctly captured, nor can it remove camera or subject shake. Sharpening an image file increases the contrast at the boundaries between different colours or tones, giving the impression of being "sharper".

Applying appropriate sharpening to a well focussed and captured image file can make a substantial difference to the quality of the final image when printed, or processed into a low resolution file for display on a screen.



Above: Sharpening applied



Above: No sharpening applied

The above examples are small crops from a DSLR that has an AA filter. The effect of applying sharpening is quite dramatic. The unsharpened image looks like it is not quite focussed as everything is slightly soft.

TYPES OF SHARPENING

There are different types of sharpening that can be applied to an image file. These are applied at different stages of the workflow. The different types and uses of sharpening are outlined below.

INPUT SHARPENING

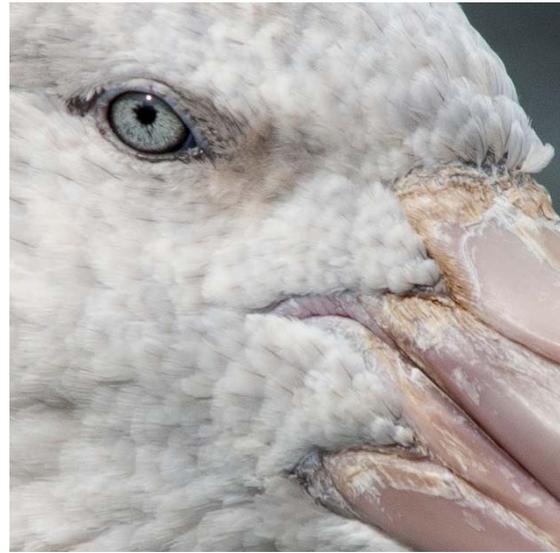
All RAW files should have some global (across the whole image) sharpening applied as part of the *initial processing steps* – see the Phototutor tutorial "*Lightroom Quick Start Guide for Processing Images*". Using the tools in Lightroom or Camera RAW, we can selectively apply the sharpening to only the edges of image areas, so we don't add noise to areas of plain colour or tone. This is achieved with the Mask tool.

In addition to the global sharpening, additional sharpening (or softness) can be applied using the selective adjustments available in Lightroom and Camera RAW. Additional sharpening should be applied carefully as it is easy to apply too much. Always apply sharpening with the preview at 100%.

Input sharpening is also added when using the "*Clarity*" tool. This applies localised contrast to areas of difference of tone and can help to add extra definition to an image. Too much Clarity will give rise to noticeable halos at edges, particularly where sky meets ground, so it is best applied with an adjustment brush.



Above: Sharpening and Clarity applied



Above: Sharpening only applied.

CREATIVE SHARPENING

Creative sharpening can be applied at the RAW processing stage using a selective adjustment as outlined above, but it is more likely to be applied once the image file has been rendered into an RGB pixel image and opened in Photoshop.

There are several ways we can apply creative sharpening to a pixel based image in Photoshop, but in all cases these should be applied on a separate layer, with adjustments for Opacity, Blend Modes and masking using a layer mask.

In all cases of creative sharpening, we are still adjusting the contrast at edges of tone and colour.

The "*Unsharp Mask Filter*" and the "*Smart Sharpen*" filters are ways to add extra sharpening for creative expression. Before applying either of these filters, first create a new composite layer that includes all previous adjustments. To do this, use the keyboard shortcut **Ctrl+Alt+Shift+E** (press all these keys at once). Next, apply the filter to this layer using either the Unsharp Mask or Smart Sharpen filter. Go to the top menu bar and select **Filter>Sharpen>Unsharp Mask**.

In the dialog box that opens, Set as follows:

Amount – Generally not more than 200, but assess with the image preview.

Radius – This gives the size of the halos of dark and light tone at edges. Use between 0.5 and 1.0 pixel

Threshold – This determines the number of tones to be used to determine what is sharpened. A value of 0 means all steps in tone will be sharpened, higher values look for greater steps between tonal values before sharpening is applied. Use somewhere between 0 and 5 as a guide.

Adjust these values to taste. When finished, click on OK to apply the sharpening. The resulting layer can then be adjusted using Opacity to fine tune the result. Also try Blend Modes such as Lighten or Darken to only apply the sharpening to selected tonal values, as well as a layer mask to remove or add the effect selectively.

Smart Sharpen works in a similar way to the Unsharp Mask filter, but with added controls for refining where the sharpening effect is applied.

Another way to add selective sharpening is to use a **High Pass Filter** Layer. To use this filter, first create a new composite layer as noted above (**Ctrl+Alt+Shift+E**). Then go to **Filter>Other>High Pass**.

Select a value between 5 and 10 as a start and click OK. The image looks terrible, but we are not finished yet. Next, go to **Blend Mode** and choose **Overlay**. Finally, adjust **Opacity** to taste.

The High Pass filter adds mid tone contrast to the image, which in some images works very well.



Above: Sharpened with Unsharp Mask and High Pass in Photoshop



Above: Original unsharpened RAW file

With the sharpening applied in Photoshop, be careful not to introduce noise in areas of plain colour, such as the background in the top right of the above image. The sharpening effects have been masked out in this area.

OUTPUT SHARPENING

Output sharpening, as the name implies, is specific sharpening that is added at the point of output, usually to an inkjet printer, but also when down sampled for export as a file used on the internet or data projectors.

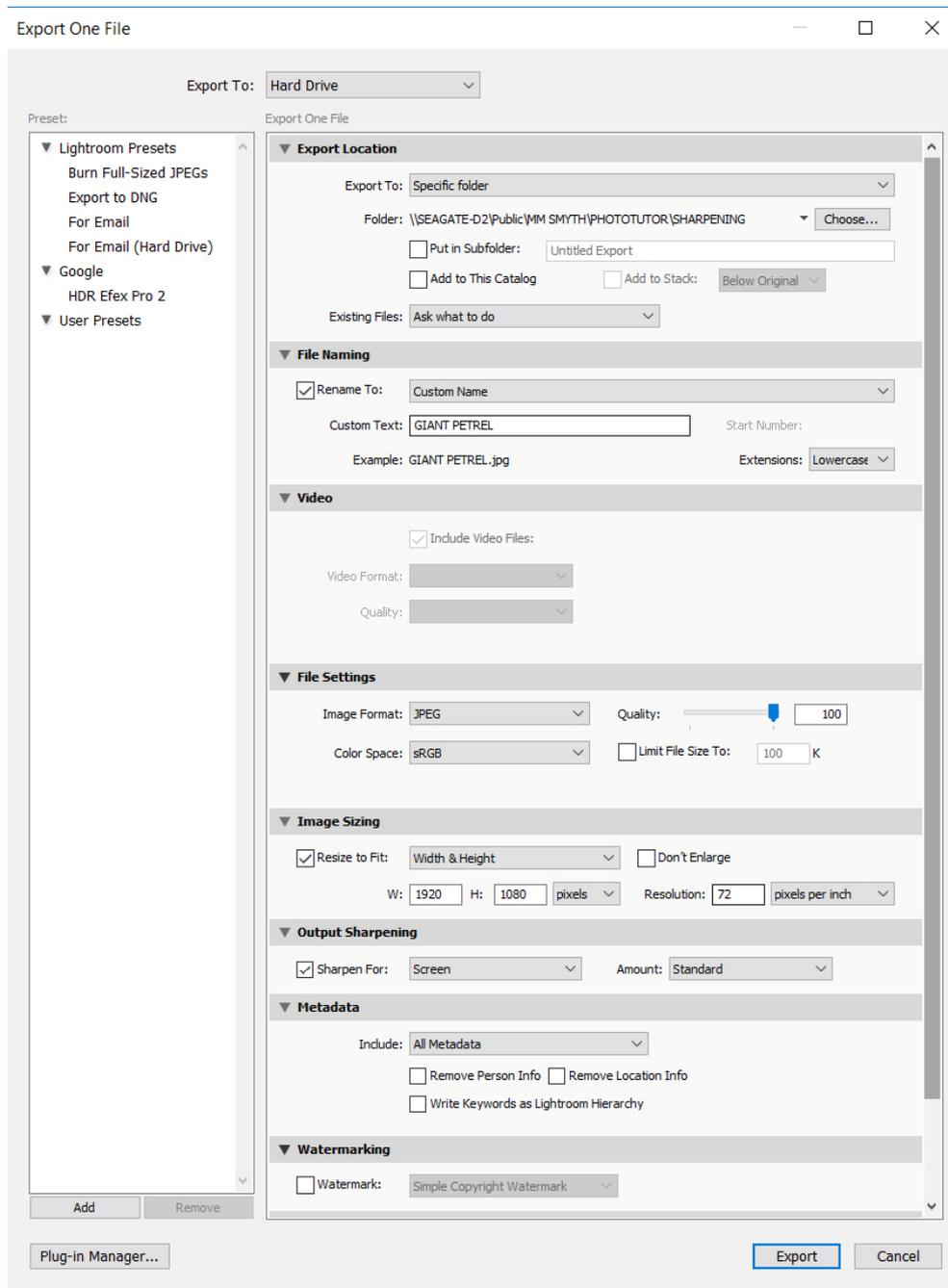
Print output sharpening is a very specific type of sharpening that is applied prior to printing on an inkjet printer. Inkjet printers introduce a small amount of softness, due to the process of blending inks together on paper, so we need to counteract this with some special treatment before the file is sent to the printer.

There are other specific things we need to do to prepare an image for printing, such as setting the size and dpi (ppi) for printing, before we apply the print sharpening. See our tutorial "**Printing to Perfection**" for a full step by step work through of the steps necessary to make high quality prints.

Resizing for use on a data projector means we need to discard up to 95 % of the image data. Projectors (unless you are using a 4K projector) only project up to High Definition, which is 1920 x 1080 pixels, or a total of just over 2 Mega Pixels. If you started with an image of 24 Mp or higher, you are losing over 90% of the image data. **Therefore it is absolutely imperative that you apply some sharpening after the image has been resized.**

Resizing and exporting from Lightroom is the simplest way to down sample your file. This allows you to change the file format and Colour Space at the same time.

To export from Lightroom, select the image file and choose **Export** from the **Library Module**. In the window that opens, Set as follows:



Left: The Lightroom Export window.

Under File Settings, for Internet or Data projection, choose JPEG and change the colour space to sRGB.

Under Image Sizing, choose Width and Height of 1920 x 1080 (High Definition) and 72 ppi

Under Output Sharpening, choose "Screen" and the amount – normally "Standard".

Depending on your processing prior to exporting, the amount of Sharpening may need to be increased or decreased.

That's a quick overview of Sharpening, so now you know what to do to make your images sing.