

**“TEXTURE, CLARITY, SHARPENING AND NOISE REDUCTION –
WHY YOU NEED THEM AND HOW THEY WORK TOGETHER”** BY MICHAEL SMYTH

This tutorial demonstrates the differences and interaction between these adjustments in Lightroom and Camera Raw. We also explain why all images need some sharpening and give our recommended workflow for applying these settings to your image files.

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.

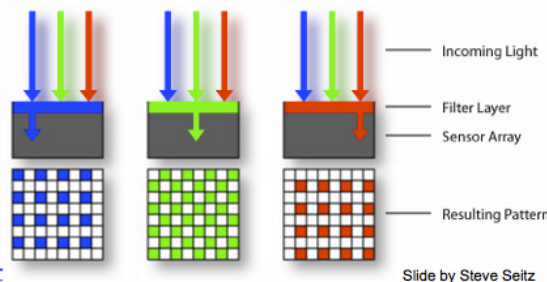
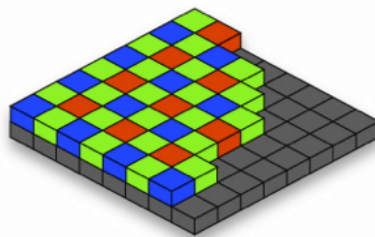
INTRODUCTION – WHY DO WE NEED TO SHARPEN ?

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



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

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 is introduced.

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, generally 24 mega pixels or higher (24 million pixels – typically something like 6000 x 4000 pixels), however many older cameras have an AA filter that increases 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 DO THE DIFFERENT ADJUSTMENTS DO ?

Texture and *Clarity* adjustments exist in the **Basic Panel** of Lightroom and camera Raw. *Sharpening* and *Noise Reduction* have a place in a dedicated panel called the **Detail Panel**.

Following the general convention of working top to bottom in the Basic Panel (see the separate tutorial called "*Lightroom Quick Development Steps*" for more details), you would apply *Texture* and *Clarity* before you progress to the Detail Panel. Let's start with the Basic Panel

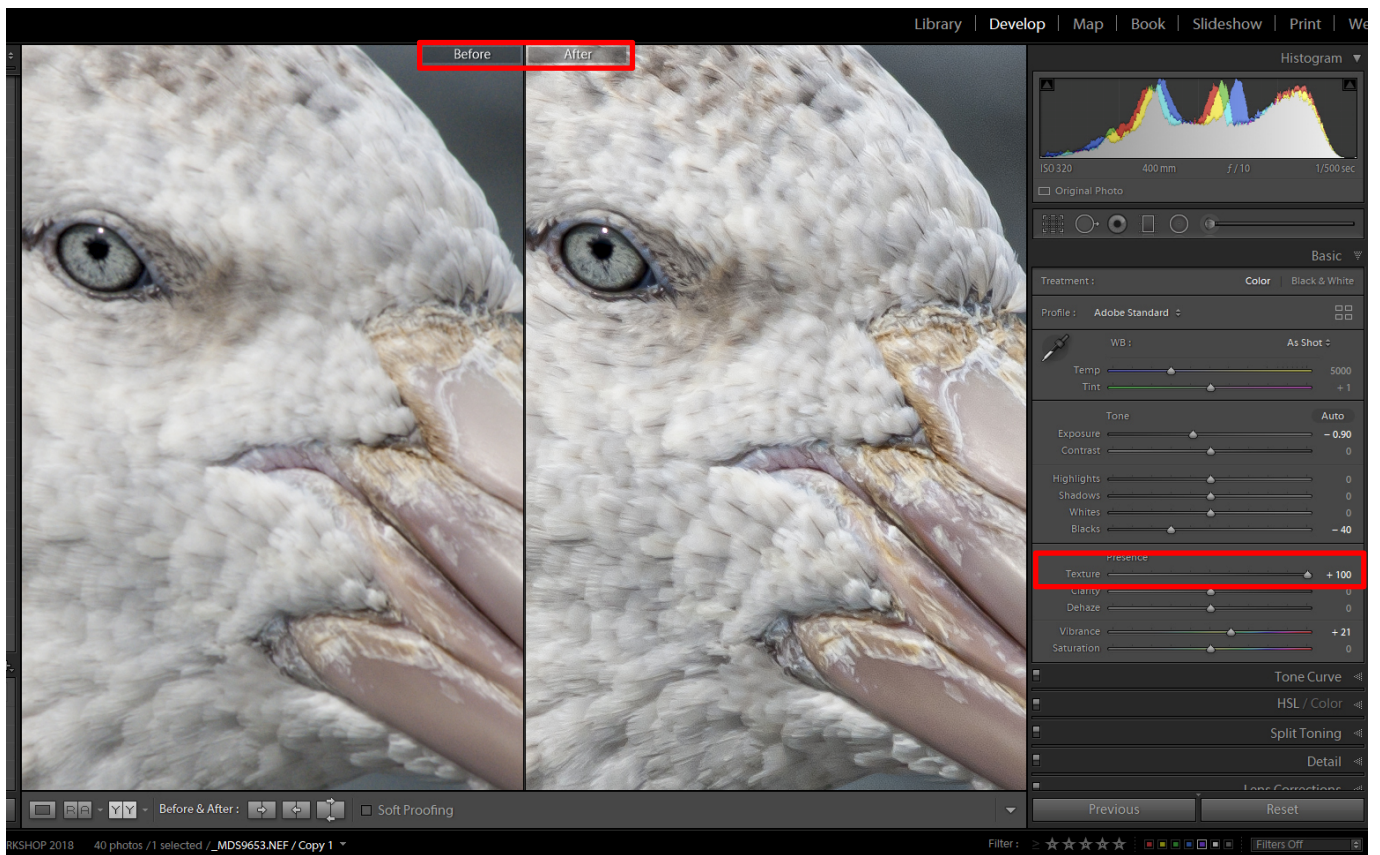
TEXTURE AND CLARITY

Texture and *Clarity* work in similar ways but target different areas of the image. Texture targets the smallest details and Clarity works on the medium to larger details. See below:

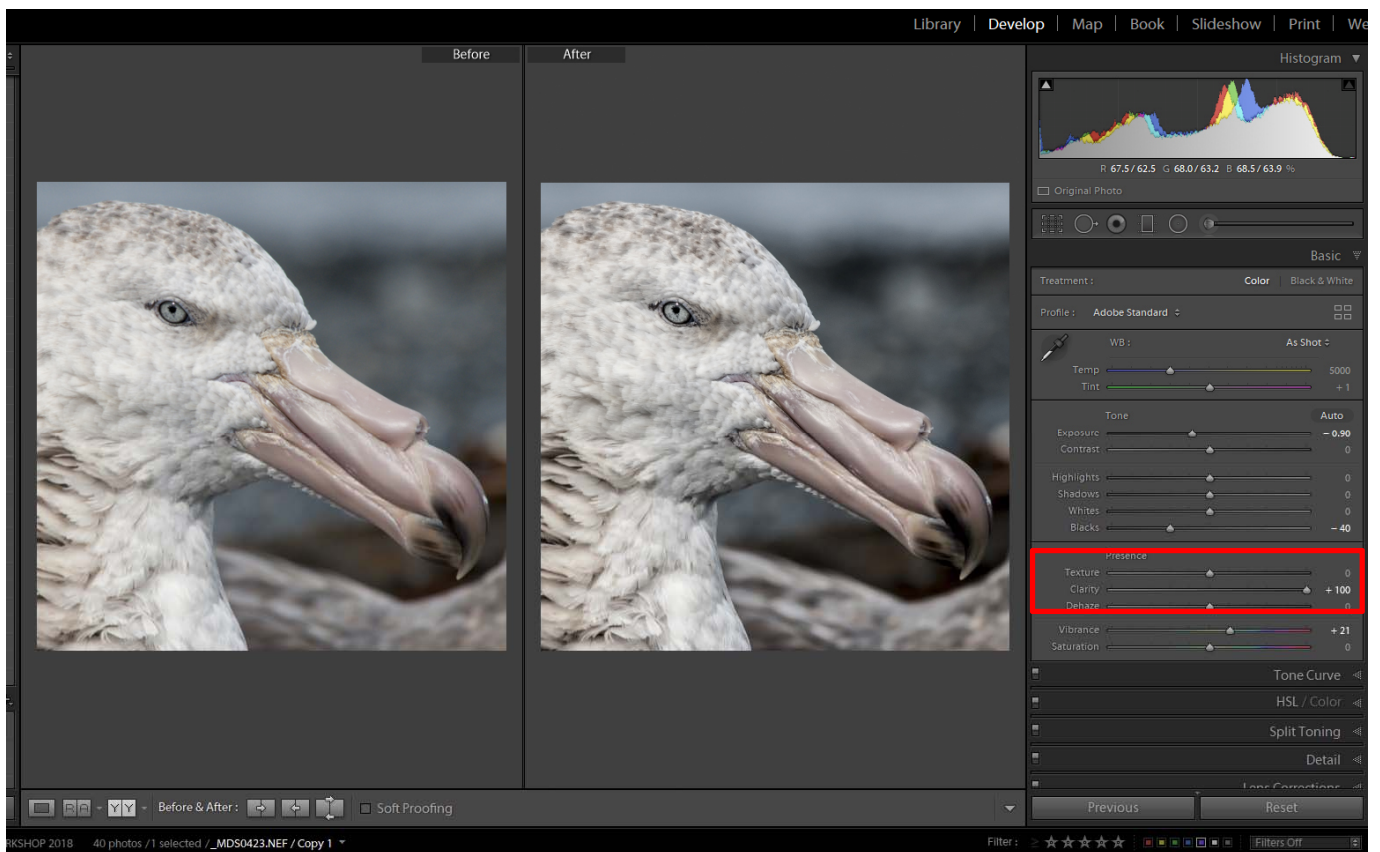


Above: A detail view of a sharply focussed image with *no Texture or Clarity applied*. Note that while sharp, the details are a little fuzzy. The background is well out of focus as it was taken with a 400mm lens with a wide aperture.

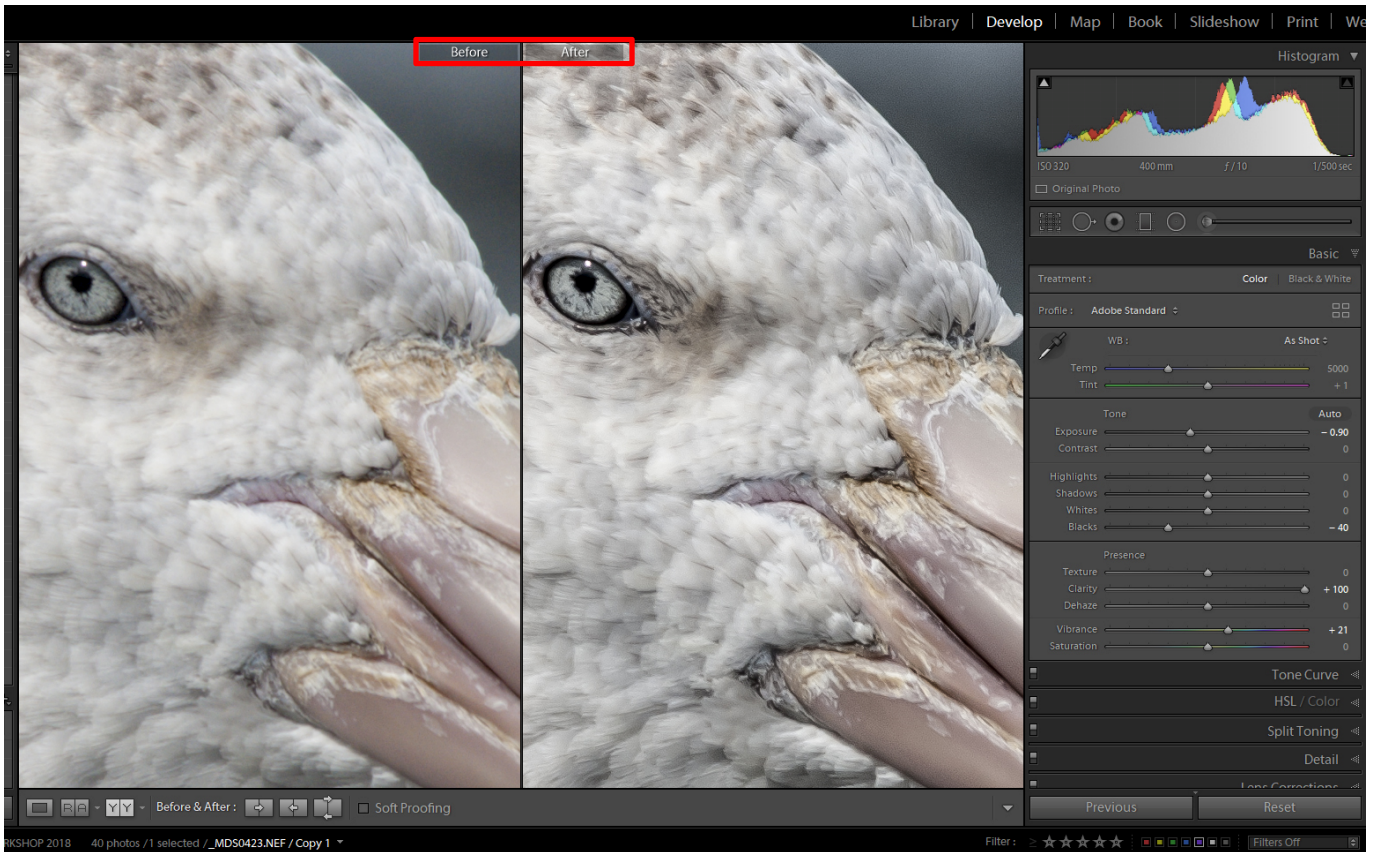
See the next image over the page for examples of Texture and Clarity applied.



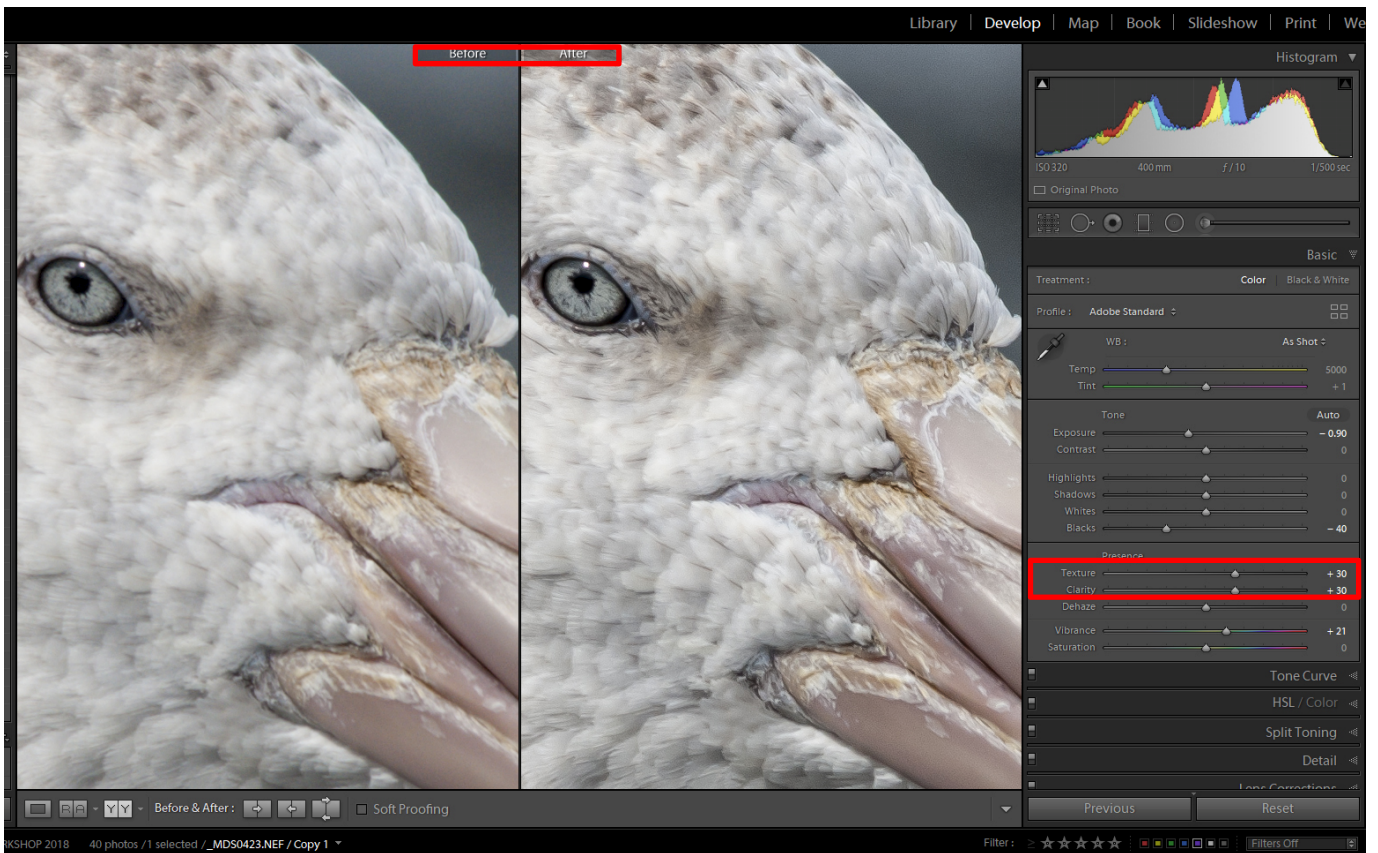
Above: the same detail with **100% Texture** applied. Note that the fine details are more prominent, however there is some overall build up of contrast. This example is for illustration only. For normal use, a setting of **20-30** would be more appropriate. Note that the before image is on the left (0% texture).



Above: The full image with 100% Clarity applied. There has been an increase in overall contrast, including the out of focus areas. There is some enhancement of the larger details.



Above: A comparison at 1:1 of the image with 100% Clarity applied. Note the increase in contrast, darker blacks and some loss of saturation in the highlights. This is for illustration purposes only.



Above: The full image with settings of *Texture +30* and *Clarity +30* applied.

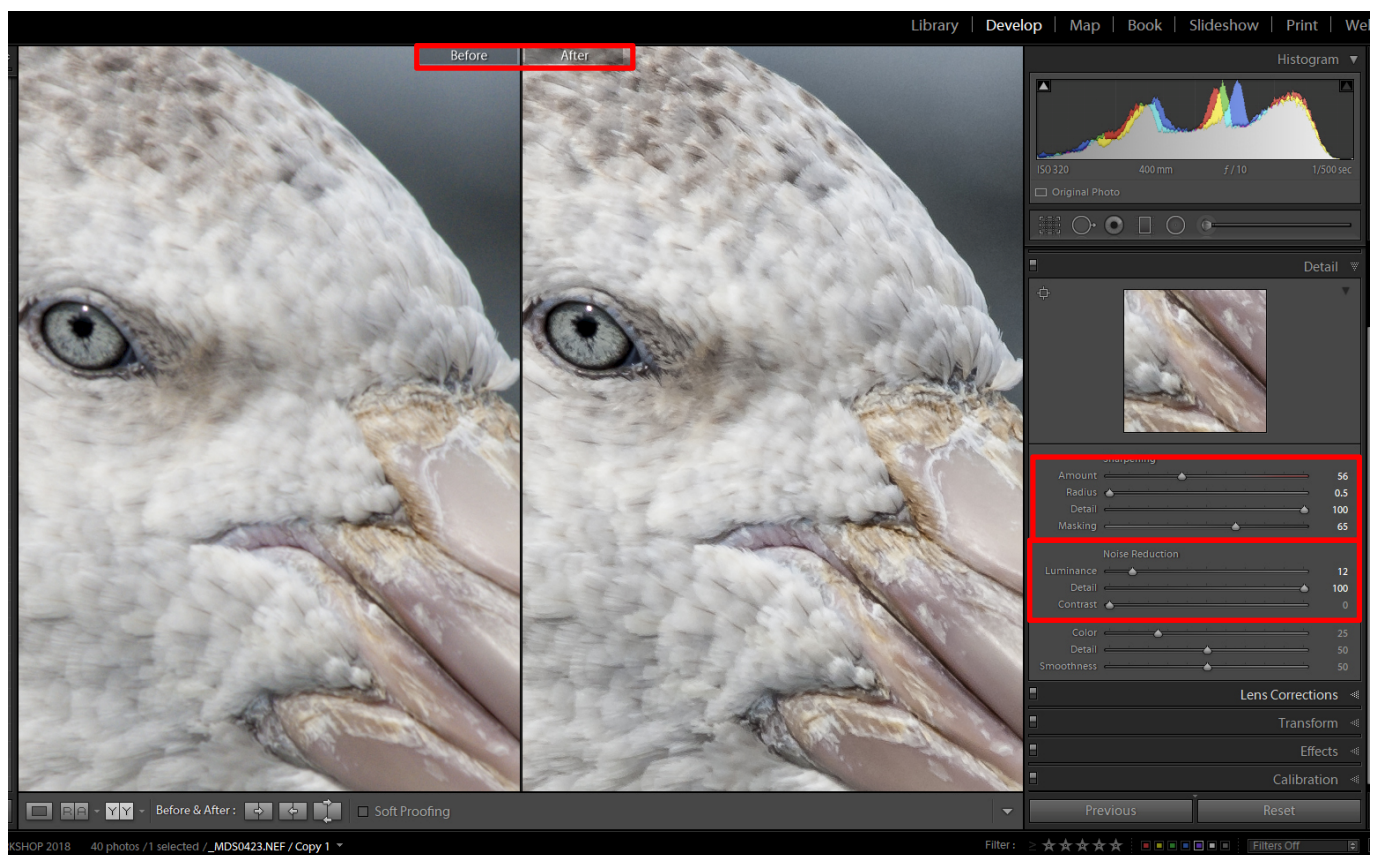
With other adjustments applied to the image as part of the "Quick Development Steps", we are ready to look at Sharpening and Noise Reduction.

WHAT IS SHARPENING AND WHAT DOES IT DO ?

Applying sharpening to an image file cannot add anything 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.

The other tools used in conjunction with sharpening are "*Texture*" and "*Clarity*", which also act to increase contrast at specific areas of the image. **Noise Reduction** is the opposite of Sharpening and is used to remove unwanted texture (Luminance Noise) and speckles of colour (Colour Noise reduction) from images, usually when either or both high ISO and long exposure times are used in the data capture.

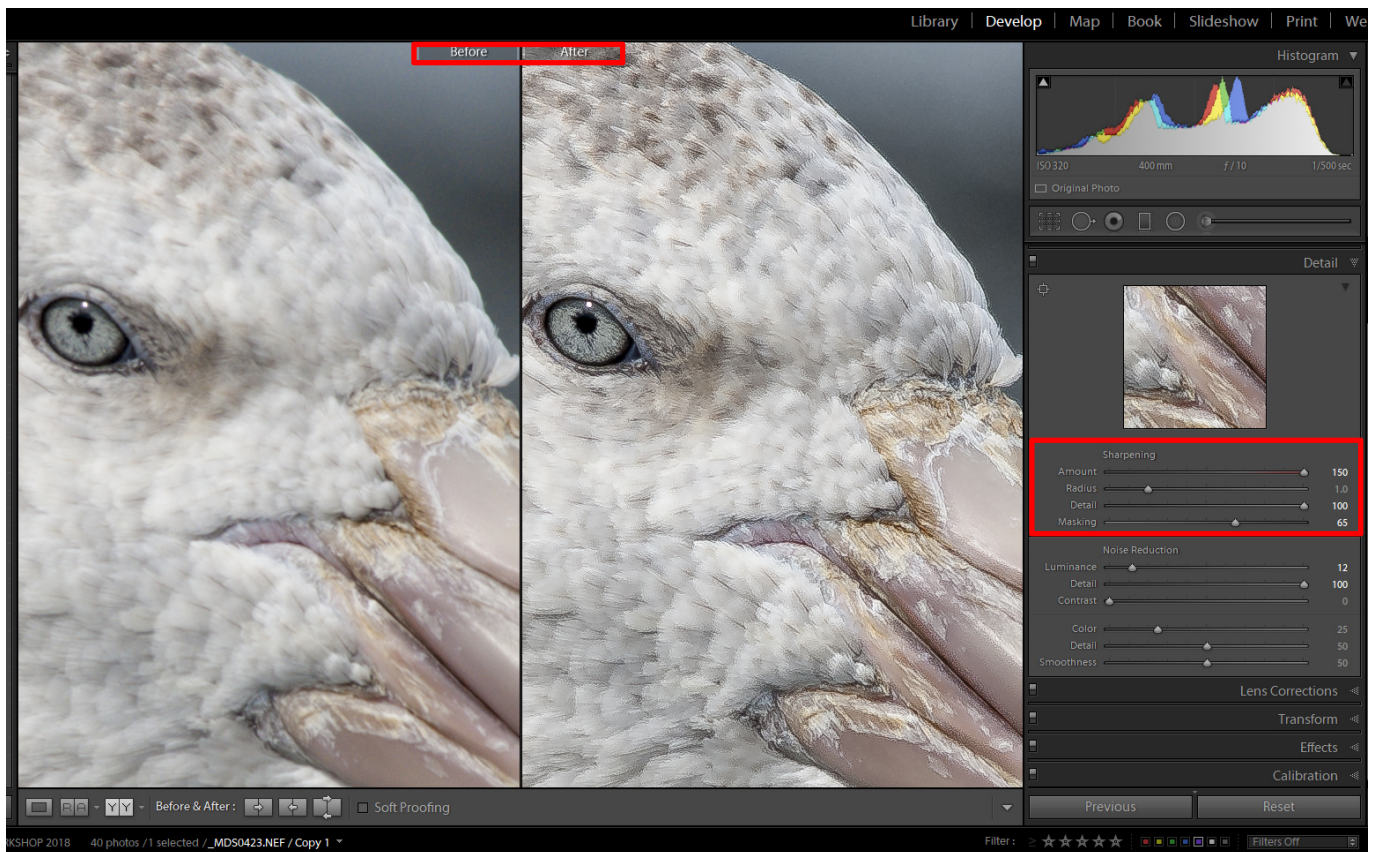


Above: Sharpening and Noise Reduction applied. For this image, **Deconvolution Sharpening** has been used, see below.

In this image, we have also used the Masking Slider with the overlay mask (hold down the Alt/Option key) whilst moving to apply a mask to the out of focus areas that do not require sharpening.

We have also applied a small amount of **Luminance Noise Reduction** as the ISO was set to 320 for this capture and a small amount of Luminance Noise (grainy speckles) was evident in the background. Keeping the Detail slider for Noise Reduction to the maximum of 100.

Using a radius larger than 1 pixel and an amount much more than 60-70 will result in nasty artefacts appearing. See the illustration over the page.



Above: Too much sharpening and too large a radius for the sharpening give rise to nasty artefacts.

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. These tools are the **Gradient**, **Radial** and **Brush** tools. Note that you do not have the same controls for sharpening when using these tools, all you have is an amount slider.

Additional sharpening should be applied carefully as it is easy to apply too much. Always apply sharpening with the preview at 100%.

The most effective way to sharpen the input from the RAW file is to use "**Deconvolution Sharpening**". This adds back some fine detail that is lost in the initial Demosaicing from the RAW data. Generally, this type of sharpening is applied to the whole image.

To apply Deconvolution Sharpening to the RAW file, use the following settings, making sure firstly that you are viewing your image at 100%:

First, set the **Radius** to the minimum – **0.5 pixels**.

Next, set the **Detail** slider all the way to **100**. (Using lower levels for Detail changes the processing to Unsharp masking, which is not what we want here).

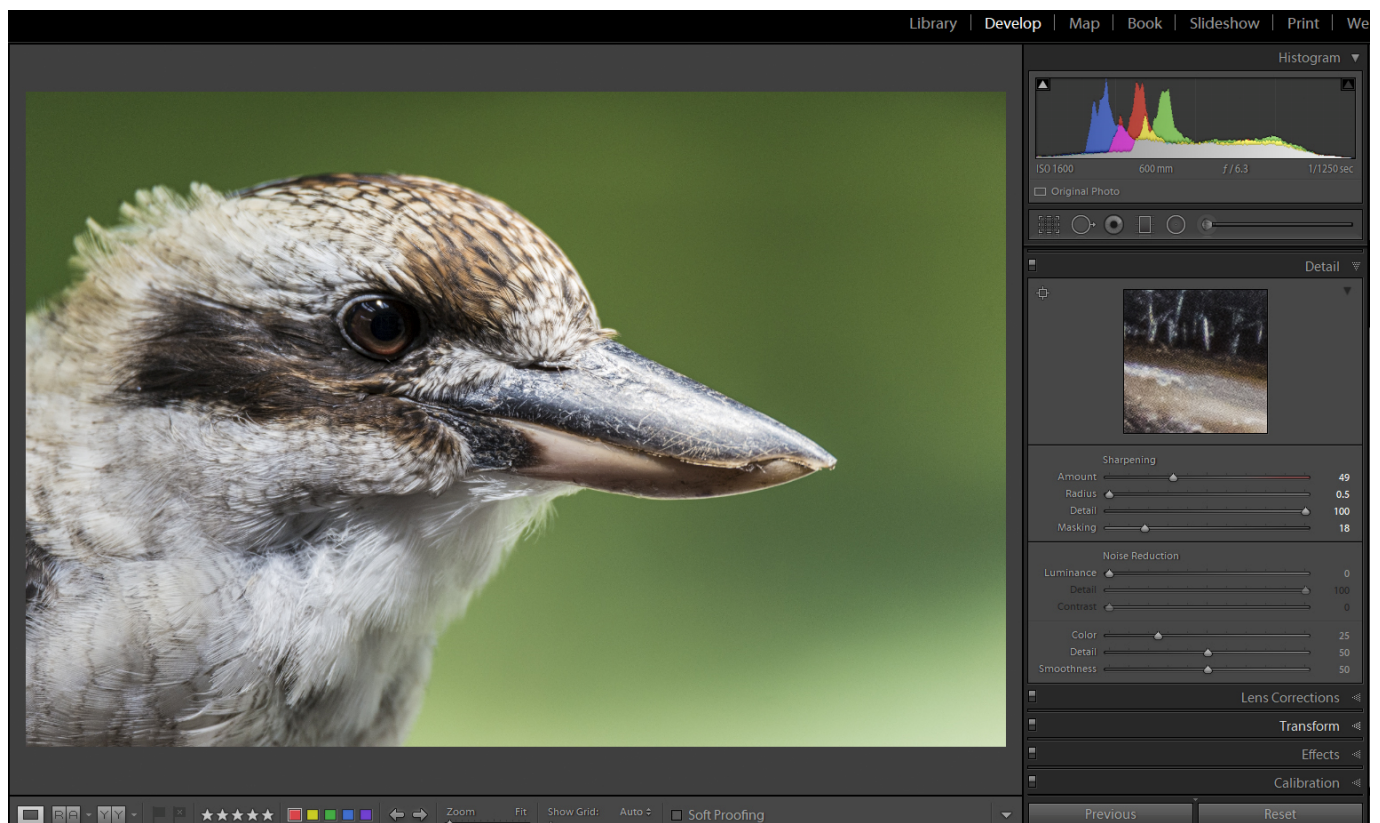
Next, move the **Amount** slider to the right and view the effects on the fine detail in your image. This amount will vary from camera to camera, but an amount somewhere between say 30 and 50 would be typical. Note the effect of adding small grain to areas of blank tone in the image. Avoid using too much sharpening that will add excessive grain.

Important Note: if you are shooting with a higher resolution sensor (24 Mp and above) and the final output of the image will be a print, some detail will be lost when the image is down sampled. For example, printing to approximate A3 size (360 x 240mm) at the optimum printing resolution of 360 ppi (for Epson printers), you need 5102 pixels wide (once we convert from pixels per inch to pixels per millimetre) by 3401 pixels high. A 24 Mp sensor will be typically 6000 x 4000 pixels, meaning to print at these settings, some down sampling is required and some of the grain evident in the Raw file will be resolved away.

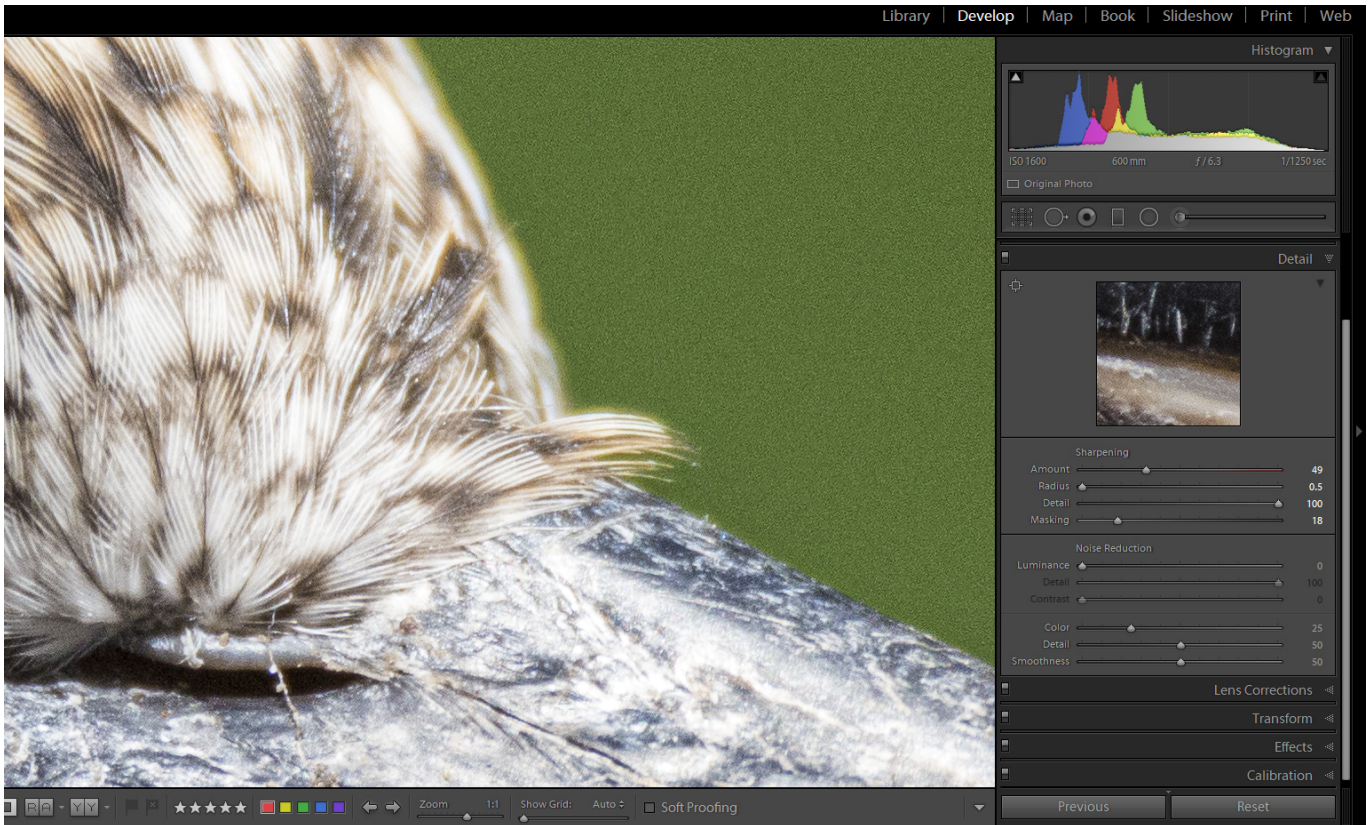
Finally, move the **Masking** Slider to the Right whilst holding down the **Alt** key to mask out areas of blank tone, but be careful, using too much masking will remove some of the Deconvolution effects from detailed areas. Look carefully at the effect of masking by releasing the Alt key to see the effect, then move the slider back to the left to see whether sharpening has been removed.

NOISE REDUCTION

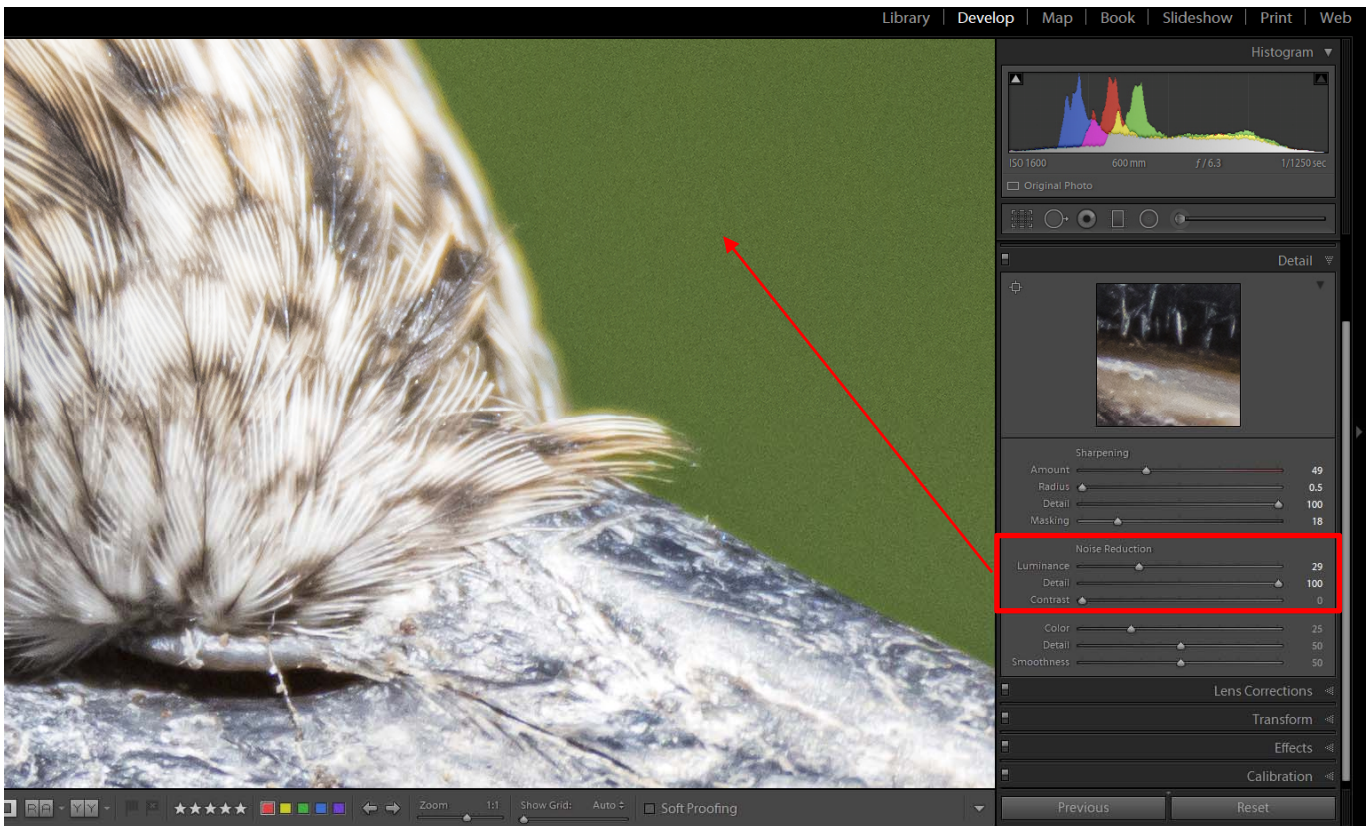
For images taken with high ISO and/or long exposures, some noise may be visible in the file after Sharpening has been applied. Usually, the Noise issue is **Luminance Noise** as **Colour Noise** is not generally an issue with modern sensors.



Above: Here is an image taken at 1600 ISO. At full size on screen, everything looks fine after sharpening.



Above: Magnified to 100%, there is evident noise visible in the out of focus areas.



Above: After applying Noise reduction at a setting of 29 and Detail to 100, the out of focus areas have been addressed. To maintain maximum detail, use a Detail setting of 100. If the image has some loss of contrast, you can use the Contrast Slider, but generally this is not an issue.

CREATIVE SHARPENING

Creative sharpening can be applied at the RAW processing stage using a selective adjustment, using the *Gradient*, *Brush* or *Radial* brushes. Here the Sharpening applied has only one slider, so use with caution.

Additional creative sharpening 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:

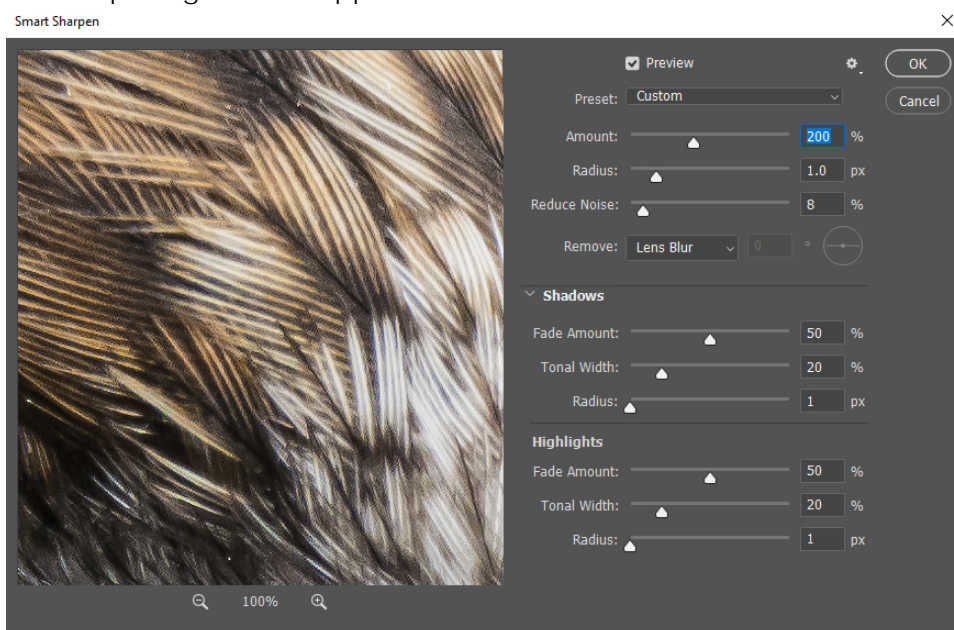
Amount – Generally not more than 200 but assess with the image preview at 100%.

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.



Left: The *Smart Sharpen* Dialog in Photoshop.

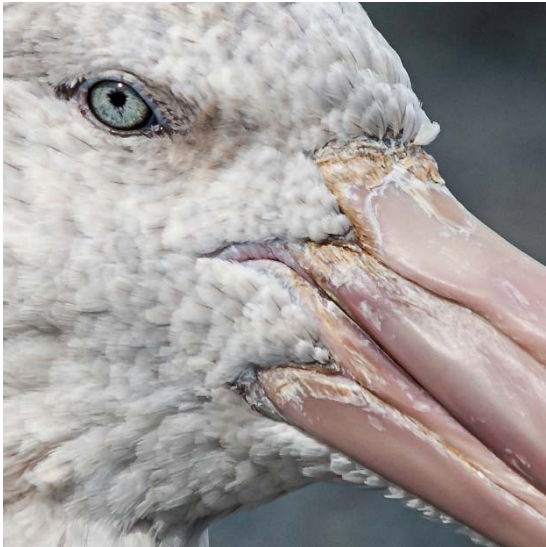
Note: the amounts of sharpening applied in Photoshop have a vastly different effect than those in Camera Raw or Lightroom.

Smart Sharpen allows the effects to be eliminated from the highlights and shadows selectively.

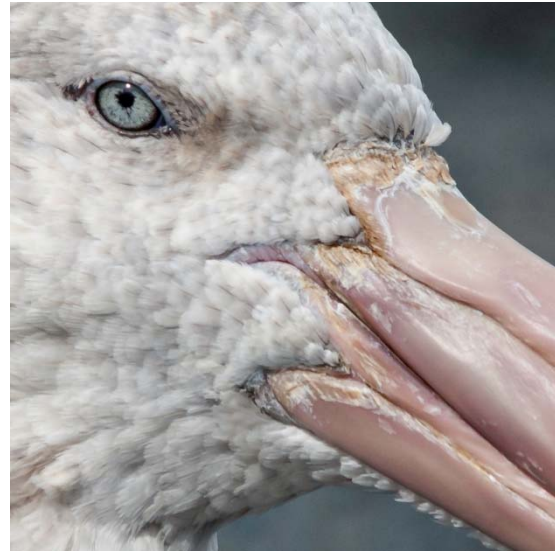
Another way to add selective sharpening in Photoshop is to use a **High Pass Filter** Layer. To use this filter, first create a new composite layer as noted above (**Ctrl+Alt+Shift+E**). Then go to **Filter>Other>High Pass**.

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 (Blended to 30%)



Above: Original RAW file after LR processing and opened in Photoshop.

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.

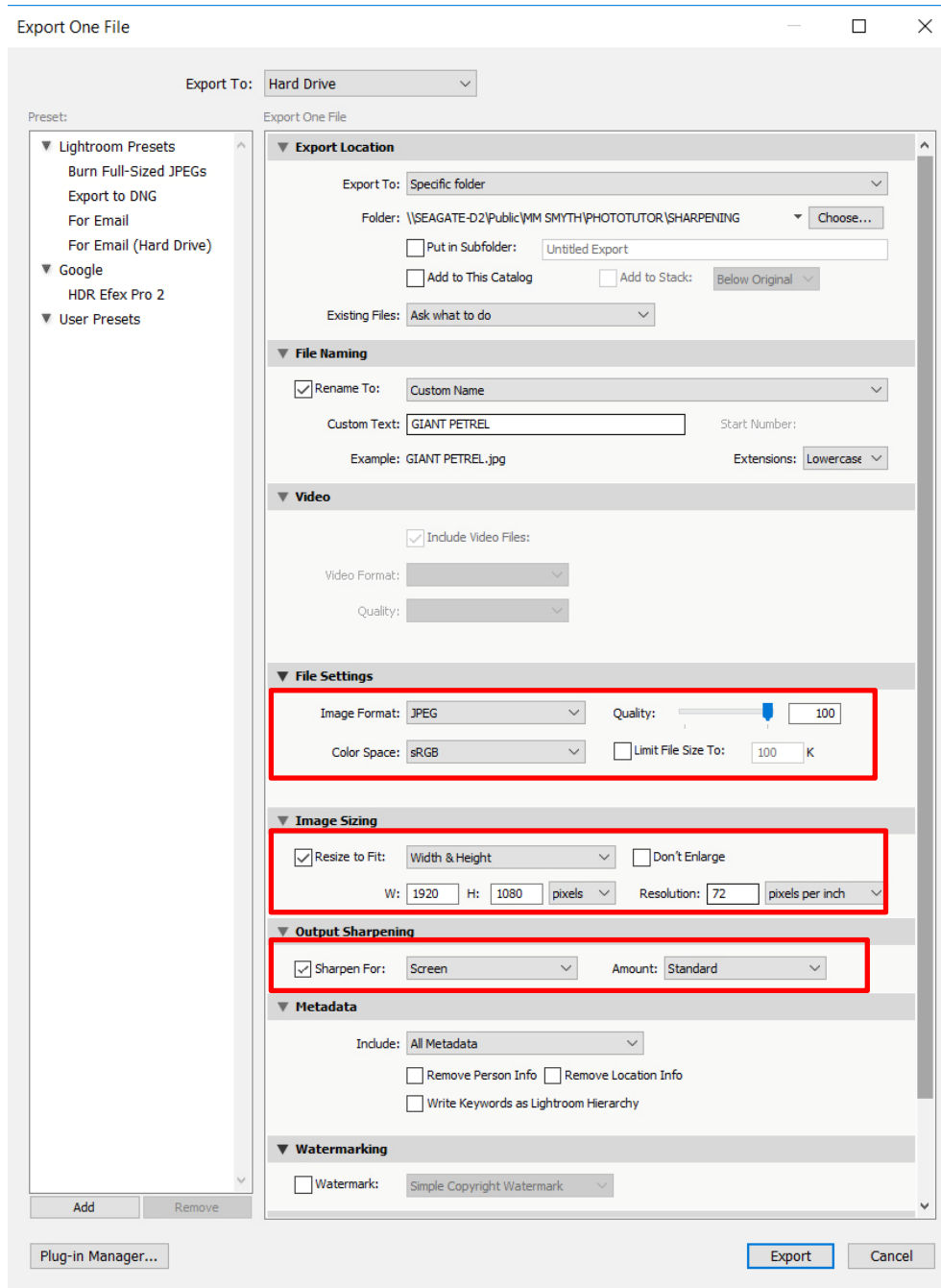
Print output sharpening is a very specific type of sharpening that is applied prior to printing on an inkjet printer. Inkjet printers introduce a small amount of softness, due to the process of blending inks together on paper, so we need to counteract this with some special treatment before the file 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. This type of sharpening is covered in our workshop "**Printing to Perfection**" and is part of a complete printing workflow.

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 for the Internet or projection. 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.

The top sections cover the location for your export and file renaming – if required.

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.