

# Image Quality

By Grant Gillespie

Software can take a terrible image and make it look better. Truly beautiful results require a sharp, well exposed image to begin with.

This month we look at image quality in terms of sharpness, tonal range (often mistakenly referred to as dynamic range) and a quick introduction to using the histogram display to improve images at the time of capture, especially 'exposing to the right'.

Poorly exposed images may require a lot of processing to make them look better, and the results, while improved, often lead to degraded image quality.

Here are some signs you have poorly exposed images:

- Needing to sharpen to the point of introducing unwanted noise
- Increasing saturation and producing unbalanced or unnatural colours
- Lightening shadows to show more detail, revealing an unacceptable amount of noise, because little detail was recorded in the first place

## Sharpness

Sharpness is how much contrast there is along edges and lines. The butterfly wing on the left has been improved using software (unsharp mask, etc).



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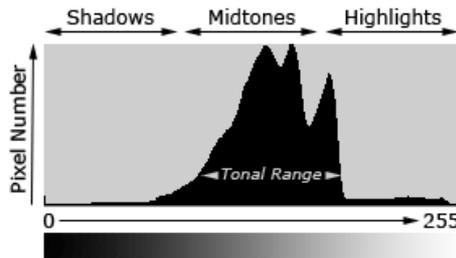
A sharper image in the first place can be achieved by reducing camera shake—improve your grip to support and hold the camera more steadily, use a tripod or increase shutter speed. Motion blur is another culprit, caused by the shutter speed being too slow for the action being captured. In both cases, to get good colours and shadow detail, increasing shutter speed calls for increasing aperture, which decreases depth of field. In cases of shallow depth of field, check focus after taking the shot, to ensure everything that needs to be in focus, IS in focus.

## Tonal Range

The range of brightness in an image between pure white and pure black is called the Tonal Range.

In the viewfinder, a photographer can judge Tonal Range by eye. Images that use the full tonal range look rich and crisp, with vibrant colours. Images that don't use the full range lack contrast, often looking flat and dull, lacking detail in highlight and shadow, or the image may just be too dark or light. Using the camera's Histogram can help decide how to increase the tonal range.

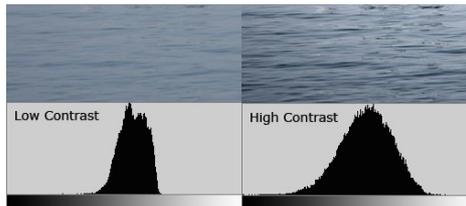
Setting the camera to display the Histogram provides a visual representation with darker colours on the left, lighter colours on the right and the height of the graph indicates how many pixels at each brightness the image contains.



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The make-up of every image is different. See the many examples in Further Reading at the end.

There are some general guidelines. The wider the range of the graph, the more **contrast** your image will have. If the graph is narrow the image may be dull and flat.



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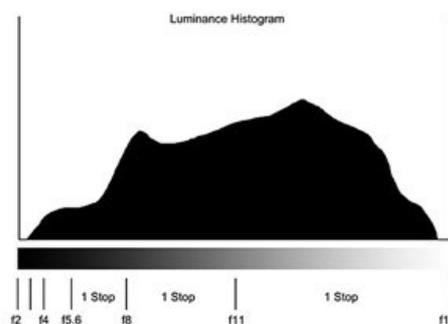
Endeavour to avoid **peaking/clipping** on the right (loss of detail in highlights) or peaking on the left (loss of detail in shadows). The right-most windmill image (right) is a good example of the histogram displaying peaking highlights.

## Exposure Warning

Most cameras have exposure warnings to indicate which part of the image is overexposed. This indicates what's peaking/clipping at the right-hand end of the Histogram. If you're 'exposing to the right', use this to back off your exposure so you don't overexpose highlights and lose detail.

## Exposing To The Right

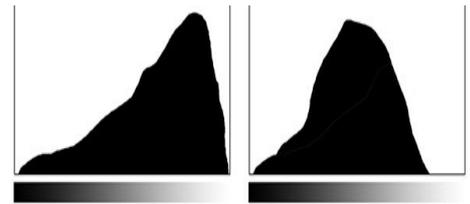
The human eye and the exposure system of cameras is based on the logarithmic scale, open up one stop and double the light hits the sensor. Three stops is 8 times the light and five stops 32 times, etc. This means that the tones between pure White and one stop less account for half of the tonal range that can be captured. Each stop below that halves the available tones to capture detail.



naturephotographers.net

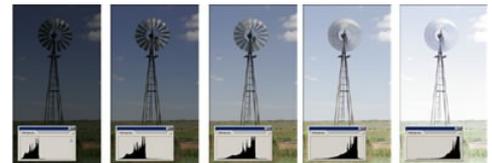
**If your exposure is only 1 stop out, you will have missed half of the available tones** to cover the tonal range of the image. Use the histogram to ensure the exposure uses as much of the tonal range as possible. The brightest tones should be just touching the right hand side of the histogram, but not

overexposing (set the flashing overexposure warning to show blown highlights). This is known as 'exposing to the right'. Aim for the histogram on the left, rather than the one on the right.



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In the windmill image, shutter speed is used to change exposure - at higher shutter speed the image is darker and the blades are frozen, at lower shutter speeds, the blades are blurred. Shifting the histogram to the right, increases the amount of detail that is captured. Be careful not to peak out the right-hand end of the histogram (overexposed highlights).



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**Highlights**—Having half the available levels of tonal detail in the brightest areas of the image means that digital cameras can capture astoundingly subtle highlights, better high-key images than film.

**Shadows**—Another reason to 'expose to the highlights', is that so few tones are available in the shadows of a digital image, only 128 in the -5th Stop range. This limits how much shadow detail can be opened up.

## Limitations of the Histogram Display

Typically, digital cameras display a single histogram when shooting, which only shows the overall luminance of an image. Many cameras display Red-Green-Blue histograms in review mode. This gives a better overall picture of how each colour is being captured e.g. if the image has large areas of saturated colour which contain important tonal differences.

The single histogram in these examples is the simple case, for easier understanding.

Not all images have all colours.

The red star image would have no midrange at all.



digital-photography-school.com

Thanks to Glenn Rossiter and Peter Simmonds for recommending great articles to research.

There are not many links below. They provide many examples of histograms for different kinds of images. I recommend you read them thoroughly. ■

Further Reading:

Exposing To The Right

<http://www.naturephotographers.net/articles0705/nr0705-1.html>

Evaluating Images

<http://www.shortcourses.com/workflow/workflow1-9.html>

Histograms

<http://www.shortcourses.com/workflow/workflow1-10.html>

<http://www.cambridgeincolour.com/tutorials/histograms1.htm>

<http://digital-photography-school.com/how-to-read-and-use-histograms/>