

## Topic 7 - How to Read Histograms

### Learning Outcomes

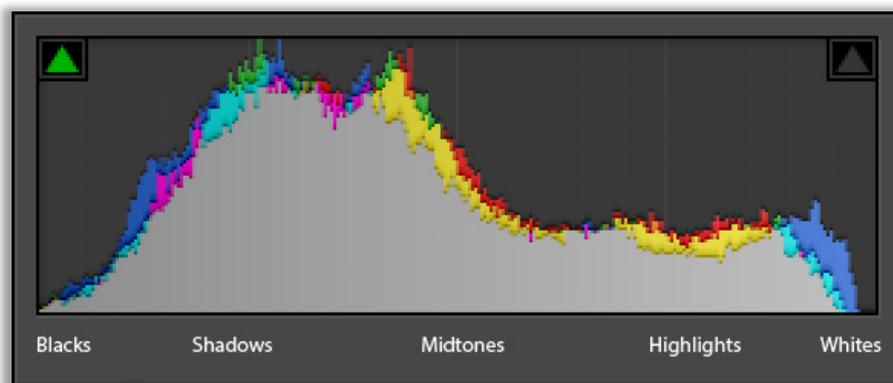
In this lesson, we will go through what histograms are and how we can read them. By the end of this lesson, you will know much more about histograms when you are trying to properly expose your scene.

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## How to Read Histograms

Understanding image histograms is probably the single most important concept to become familiar with when working with pictures from a DSLR. A histogram can tell you whether or not your image has been properly exposed, whether the lighting is harsh or flat, and what adjustments will work best. It will improve your skills on the computer in addition to your skills as a photographer.

Histograms can be found in almost any modern image editing software. Most current digital cameras, including some compacts, can also display histograms. Many beginner, and even experienced photographers don't seem to understand what exactly histograms show. There is nothing wrong with that, as histograms may appear to be rather complex at first. Truthfully, they aren't.



1) A  
Basic

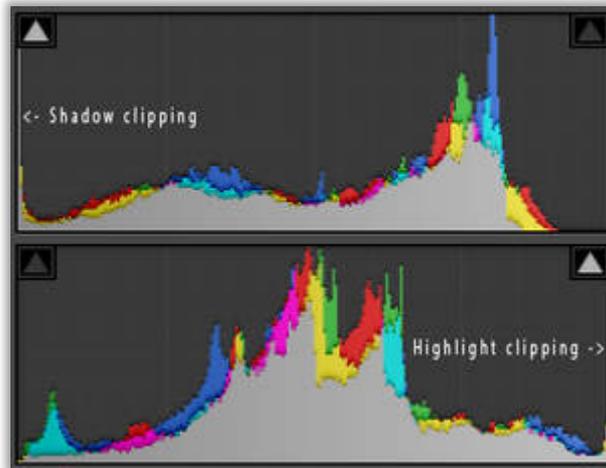
## Understanding

A histogram is a graphical representation of the tonal values of your image. In other words, it shows the amount of tones of particular brightness found in your photograph ranging from black (0% brightness) to white (100% brightness). We can see in this image; dark tones are displayed on the left side of the histogram. As you move rightwards, tones get lighter. The middle portion of the histogram represents midtones, which are neither dark nor light. The vertical axis of a histogram displays the amount of tones of that particular lightness. Histogram is exposure-dependent, but is also affected by tone curve and other settings.



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## 2) Shadow and Highlight Clipping



Source: [photographylife.com](http://photographylife.com)

If a certain portion of the histogram is “touching” either edge, it will indicate loss of detail, this is also called clipping. Highlight clipping, which are areas that are completely white and absent of detail, occurs if the graph is touching the right side of histogram. Shadow clipping, which refers to areas that are completely black and absent of detail, occurs if the graph is touching the left side of histogram. Either case can be often fixed by altering exposure settings, which we’ve already looked at. However, you must remember that it all depends on the scene because every scene is different.

For example, if there’s sun in your scene, it is only natural that it will be very bright – maybe even completely white, and highlight clipping will occur. If you want to see whether there is any clipping as you photograph, engage histogram in your camera as you review images. Each camera is different – Nikon cameras, for example, usually require you to press navigator keys up or down a couple of times in review mode before the correct settings come up.

Many current DSLR cameras have live histograms that react to your scene in real time. To engage live histogram, you will need to use the LCD screen of your camera to photograph instead of optical viewfinder/ Live View mode. Should you notice any highlight or shadow clipping, alter your exposure accordingly To save shadow detail,



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make images brighter by dialing in positive exposure compensation value, such as +0.3 or +0.7. To save highlight detail, make images darker by dialling negative exposure compensation value, such as -0.3 or -0.7. Exposure compensation is usually set using “+/-” button on your camera. If you prefer to shoot with manual settings, just change ISO, aperture or shutter speed accordingly.

## 3) The Color Channels

Histograms usually display information for three primary colours – red, green and blue – and these are known as RGB histograms. Such is the histogram shown here. You will notice that it consists of several diagrams marked with different colours. Three of these diagrams represent red, green and blue colour channels accordingly. Grey diagram shows where all three channels overlap. Yellow, cyan and magenta appear where two of the channels overlap.

## 4) Histogram and Exposure

Some photographers are used to seeing histograms as graphical representations of exposure. Quite a few photographers are thus used to evaluating exposure based on histograms alone and state them as either “good” or “bad”. Usually, a “good” histogram would render most tones in the middle portion of the graph, and no or few tones would be found at the extreme edges.

A “bad” histogram would have tones at the very edges of the graph, which would basically mean either underexposure to the point of lost shadow detail (shadow clipping), or overexposure to the point of lost highlight detail (highlight clipping), or even both in a single image. If we agree with this approach, the histogram shown here would represent an image that is slightly underexposed, due to the fact that tones are shifted slightly to the left. It is almost perfect.



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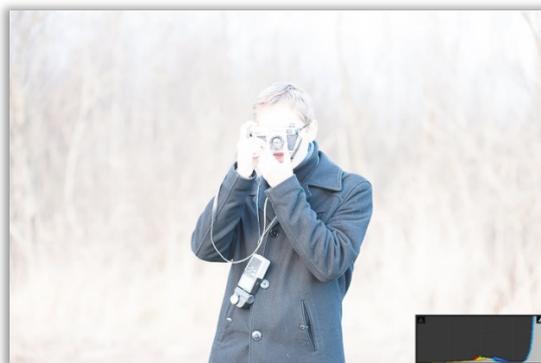
## 4.1) Underexposure

The first image shows an underexposed photograph (too dark). As you can see, most of the image lacks any sort of bright detail. Histogram clearly shows a strong shift to the left side with most tones in the shadow range, and some are even clipped (completely black).



## 4.2) Overexposure

The following image is overexposed (too light). Many tones are very bright and there are basically no darker tones. A large portion of the image is blown-out (completely white) and bears no detail at all. As you can see, the histogram confirms that the image is much too bright – it is shifted strongly to the right.



Do you notice a small amount of midtones displayed in the histogram? They represent the jacket, which, in reality, is black. The tones of the coat should be shown at the left side of the histogram as “shadows” in a well-exposed image. Let’s see if that is true by looking at the following image. It is exposed correctly and bears a much broader tone distribution with most of them found in the “midtone” section of the histogram.



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## 4.3) Correct Exposure



Let's analyse the histogram of that last image. As you can see, there are barely any tones at the extreme left-side of the histogram, where blacks are shown, which means there is no detail lost in shadows. Then we see it spike – and as we mentioned earlier, this portion of the histogram shows the tones of the black coat. It is sufficiently dark, yet still bears enough detail. Note that the spike ends with the blue channel – it represents the tones of the scarf. Moving leftwards, we see a decrease in the amount of lighter-than-the-jacket-tones.

Clearly, if we examine the photograph, the coat is more or less the darkest element of the photograph. Any other portion of the image is significantly lighter. Then we see our histogram spike up quickly again. These values represent the background, which is moderately bright and takes up the biggest portion of this particular photograph. The histogram confirms this. Gradually, as the tones get lighter, their amount decreases – that's where information about the lightness of the man's face and sky is represented. Both these areas are small, but noticeably lighter than the background. Finally, we end up with a small amount of highlights. We can find them in the lightest portions of the sky as well as the object the man is holding.



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## 5) Should you Set Exposure using Histogram?

Based on these samples, a “good” histogram – one with most tones stored in the middle portion – does in fact indicate correct exposure. Does that mean histogram can indeed be used to judge exposure? Not exactly. Let’s examine one more example of a product photograph with a completely different histogram to the “good” one shown earlier.



As you can see, histogram is shifted heavily towards the right where bright tones are represented. If you were to judge the exposure of this particular photograph based on the histogram alone, you would probably say it is overexposed considerably. There is barely any sign of mid-tones, let alone shadows. However, would you say that the image above is not exposed properly? If I alter my exposure settings and aim for the “good” histogram, this photograph would be much too dark. A simple conclusion can be drawn, then: the histogram is not necessarily good for evaluating your exposure. The “correctness” of it depends on too many factors, not the last of which is your vision as well as the scene you are photographing.

The histogram simply shows you the amount of tones of various brightness levels in your image, and nothing more. It can be used to discover whether you have clipped any highlight or shadow detail at specific exposure settings. You can use it as a guide to avoid such loss of detail as you take pictures, and that is where histogram excels. As long as you keep that in mind, in general, there is no “good” or “bad” histogram.



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## Conclusion

Most digital cameras are better at reproducing low key scenes since they prevent any region from becoming so bright that it turns into solid white, regardless of how dark the rest of the image might become as a result. High key scenes, on the other hand, often produce images which are significantly underexposed. Fortunately, underexposure is usually more forgiving than overexposure, although this can compromise your signal to noise ratio.

Some degree of noise is always present in any electronic device that transmits or receives a "signal." For digital cameras, the signal is the light which hits the camera sensor. The signal to noise ratio (SNR) is a useful and universal way of comparing the relative amounts of signal and noise for any electronic system; high ratios will have very little visible noise whereas the opposite is true for low ratios. Detail can never be recovered when a region becomes so overexposed that it becomes solid white. When this occurs, the highlights are said to be "clipped" or "blown." If unsure, always drop down a little darker in terms of stops than moving up in stops, and risking losing detail. If you're shooting in raw, you can probably retrieve the detail.



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## What have we learned in this lesson? A Summary

We have learned about how histograms work and how they are very important in your understanding of digital photography. This will give you the upper hand the next time you are looking at exposing your photographs correctly.

