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Thinking Digitally

The first step in digital photography is to create the best possible picture in the field. The second step is to optimize that capture and use software to present the final image in the best possible way. Digital photography requires embracing certain concepts and techniques in addition to the traditional photographic tools. The better your photographic techniques and the more efficient your digital workflow, the less time you'll spend on the computer doing mundane tasks and fixing mistakes. Similarly, knowing the capabilities of the digital dark-room will enable you to capture images that you can optimize to portray whatever you envision. This chapter covers some of the basic digital concepts you need to consider while in the field, as well as some common digital concerns.

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Photographic Techniques

With the advent of digital photography, some people erroneously thought that they didn't need to be as conscientious in the field; they assumed they could "fix" the image in Photoshop. In fact, nothing could be more harmful to the quality of your images than to be sloppy in the field with plans to "fix" the images later. Whether digital or film, the basics of photography remain the same. You still have to do everything possible to take the best pictures you can in the field. That way, you can devote the time you spend at your computer to optimizing images and being creative, rather than trying to compensate for mistakes you made while taking the pictures. Using Photoshop in conjunction with good photographic techniques will enable you to create images that are closer to what you envision than was ever possible in the past.

With digital cameras, you still need to use most of your photographic tools to help create the best images possible, including tripods, mirror lockup, and cable releases when appropriate. Although we claim to sharpen images in a raw converter or Photoshop using the Unsharp Mask or Smart Sharpen filter (techniques described in Chapter 10, "Output"), this sharpening is not designed to fix an out-of-focus picture. Rather, its intent is to compensate for the slight softening that occurs in the digital process.

Focus carefully and accurately so that you capture the sharpest picture you can. Use a tripod whenever it's reasonable. In fact, using a tripod is essential when you want to combine images to expand exposure latitude, and it's highly recommended when you intend to create a panorama by stitching together several individual photographs. If you don't use a tripod when taking several pictures at various exposure settings in order to create an exposure latitude composite, then when you try to combine them into a single image (discussed in Chapter 8, "Composites"), the images may not combine properly; in fact, they may not merge at all. If you try to shoot a panorama without a tripod, you're likely to encounter a variety of complications when you try to stitch them together, a topic also covered in Chapter 8.

Use a reflector, polarizer, or split neutral-density filter when appropriate. Even though it's essentially possible to create a custom neutral-density filter digitally in Adobe Camera Raw or by using adjustment layers and layer masks, if the scene lends itself to using a split neutral-density filter, as in Figure 1.1, it will save you time and effort later, so use it! However, you no longer need to use a warming or cooling filter since adjusting the white balance will alter the image in very similar ways.

Choose your camera settings such as Aperture Priority, Shutter Priority, or Manual to create the type of image you have in mind. Planning to use Photoshop is not an excuse to suddenly rely on the fully automatic shooting modes. Many nature photographers shoot in Aperture Priority or Manual because controlling the depth of field is their primary concern. If you envision a picture with a shallow depth of field, photograph it that way using a wide aperture to begin with rather than relying on one of the blur filters within Photoshop. Use a filter later to accentuate the effect if desired. Occasionally nature photographers choose to use Shutter Priority for a specific need, such as to create a blur of birds in flight) or to create a pleasing softness to moving water (as shown in Figure 1.2). Although you can create motion blurs in Photoshop, planning your image ahead of time (for example, using a slow shutter speed combined

with panning) enables you to capture images with motion effects that would require a lot more time to make digitally. In some cases you can capture motion effects that would be nearly impossible to re-create in Photoshop, because objects closer to you blur more than objects that are farther away.

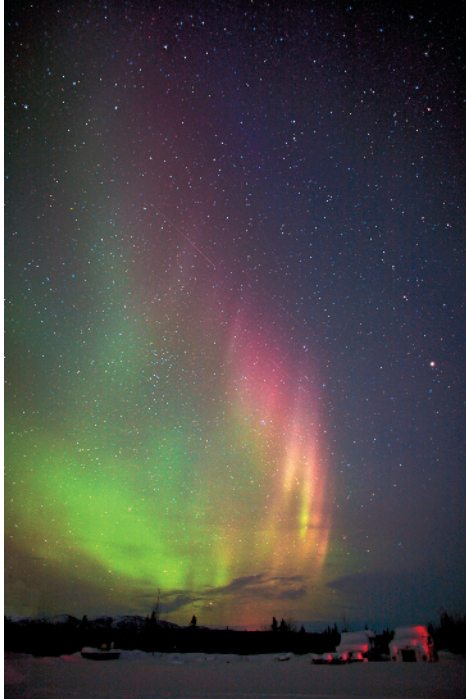


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Figure 1.1 Use good photographic techniques, including tripods, cable releases, and even split neutral-density filters, when appropriate, to capture the best images possible and then optimize them in Photoshop for impact.



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Figure 1.2 Using a slow shutter speed can create pleasing effects with moving water that would be difficult to emulate in Photoshop.

Compose carefully. Take the time to create a pleasing composition so you can use all the pixels your camera is capable of capturing. Of course you can crop the image later, but that means you will be cropping away pixels. With fewer pixels your final image may not be able to be printed as large as you had hoped or have as much detail.

Careful metering is as important as ever, but easier since you now have a histogram to give immediate feedback as to whether the exposure is correct. Meter as you always have, but make it a habit to check the histogram, at least for the first image in a series, to see whether you need to tweak your exposure.

Note: A full discussion of photographic techniques is beyond the scope of this book, but we recommend *Digital Nature Photography: The Art and the Science* by John and Barbara Gerlach (Focal Press, 2007).

Choosing RAW versus JPEG

It's funny how this became such an emotionally charged topic for some, almost akin to the classic "which is better?" debates, such as Nikon versus Canon or Mac versus PC. The truth is both formats have advantages and disadvantages, which we'll discuss. However, the evolution in software to convert raw images has made it just as easy, and in most cases more efficient, to use raw files rather than JPEGs. Most professionals now agree that it's best to shoot in RAW whenever possible.

Before considering the benefits of each format, we'll define what each one is. RAW is actually a pseudoformat used to refer to a lot of camera manufacturers' proprietary formats: Canon CR2 and CRW, Nikon NEF, Olympus ORF, Fuji RAF, and more. It's a category of files rather than a specific file format like JPEG and TIFF. Raw files are similar to film negatives. They're files containing all the information about the amount of light that was captured by each sensor. Parameters such as color space, white balance, sharpening, saturation, contrast, and so on are recorded as metadata or tags, but they're not applied to the image in-camera. You can still readily modify all these parameters at the time of conversion.

JPEG is a file format that uses lossy compression each time you resave your file in order to decrease the file size. This means as the pixels are compressed, data is thrown away, even the initial time when the camera first writes the image. Each time thereafter that you *resave* your image after making any change, it is recompressed, and more data is lost. Although you may not notice any problem with the initial image, if you resave an image often, you are likely to see some degradation in image quality. Figure 1.3 presents sections of the same image at 100 percent magnification. The first version was a raw file saved as a TIFF file; the second version was resaved numerous times as a JPEG, with only the name of the file changed each time, to illustrate the potential image degradation that can occur.

TIFF is a generic file format people often use to save their raw files after conversion or to save images that were initially shot as JPEGs. TIFF files can be compressed, but they use lossless compression, so you can resave your files with no loss of image quality. TIFF files are larger than JPEG files, meaning that they require more space on a hard drive.



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Figure 1.3 A section of an image originally captured as a raw file and the same section after being resaved multiple times as a JPEG.

Another difference among these formats has to do with something called *bit depth*. Many nature photographers start to feel in over their heads when computerese slips into the discussion, but bit depth isn't very complicated. In simple terms, a *bit* is the smallest unit of information that can be recorded digitally—either a 1 or a 0—and it refers to black or white (even in a color image). In an 8-bit image, each color channel (red, green, and blue) contains 2^8 or 256 possible tonal values. Since each channel has

256 possible tonal values, each pixel has 16.7 million ($256 \times 256 \times 256$) possible color values, as shown in Table 1.1.

► **Table 1.1** Colors and Bit Depths

| Bit Depth | Typical Format | Possible Colors per Component | Possible Colors per Pixel |
|-----------|----------------|-------------------------------|---------------------------|
| 8 bits | JPEG | 256 | 16.7 million |
| 12 bits | RAW | 4,096 | 68.7 billion |
| 16 bits | PSD, TIFF | 65,536 | 281 trillion |

Now, 16 million color choices may seem like more than enough, but in reality, at times the transitions between tones in an 8-bit image are not smooth, which is called *posterization* or *banding*. Twelve-bit images, which is what many cameras can capture in RAW, have 4,096 tonal values for each color channel, which means a choice of 68.7 billion ($4,096 \times 4,096 \times 4,096$) possible colors. Some of the newest high-end digital SLR cameras capture 14-bit images, which means nearly 4.4 trillion color choices ($16,384 \times 16,384 \times 16,384$). Tonal gradations are much smoother with so many possible values for each pixel.

JPEG images are limited to 8 bits, so some JPEG images may demonstrate posterization. Although not a problem for many images, some images, particularly those requiring smooth gradual transitions of saturated bright colors and tones, such as sunset pictures, may show evidence of banding. Clearly, more detail can be accurately conveyed the higher the bit depth. Eight-bit color files used to be common, but 16-bit images are now the standard for most photographers. Thirty-two-bit files are starting to emerge and can be created using Photoshop's Merge to HDR, which we'll cover in Chapter 8. (HDR stands for *high dynamic range*.)

It may seem confusing initially that in Photoshop you have options to choose 8-bit or 16-bit images (or 32-bit if you've created an HDR image) when a JPEG image is clearly an 8-bit file and a raw file is either a 12- or 14-bit file. Converting a 12-bit capture into an 8-bit file results in a smaller file in which you have discarded 3,840 possible tonal values per color channel, and even more if the image was a 14-bit file. That's a lot to throw away!

When you convert a raw file that is initially 12 or 14 bits into 16-bit space, you retain all your original data. You can use the additional tonal values as you make adjustments to the image. In other words, as you tweak the color and tonal values within the image, the adjustments can take advantage of the additional tonal options. Way back in Photoshop 7, there was minimal support for 16-bit images, but all of the more recent versions of Photoshop offer considerable support, making it logical to convert into 16-bit space.

What's So Great about RAW?

A lot of things! As just described, you have many more possible tonal values, which offer the possibility of more accurate detail in your photos and smoother tonal transitions. But RAW has other advantages as well. For example, you can “expose to the right” (as we'll describe shortly, in the “Exposure” section of this chapter) to optimize

the signal-to-noise ratio and then correct the exposure in the raw converter to yield the most accurate tonal information with the least problems from noise.

More important, all the information captured by the sensor is available, and during the conversion process, you determine how it appears. A tremendous amount of flexibility and control is available to you as to how to present the information you captured on the sensor, as you can see in Figure 1.4. The raw capture (top) was converted with settings that revealed significantly more color than was captured in the JPEG version (bottom) of the same image. No pixels have been damaged, and yet the image is significantly more dramatic.



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Figure 1.4 Notice the increased color and impact of the raw capture as compared to the rather bland JPEG capture.

You can modify the exposure of raw files after the fact, making the image lighter or darker, sometimes significantly lighter or darker. In most cases, you can tweak the exposure in the raw converter such that there is rarely a need to bracket exposures by a third of a stop in the camera anymore, except when you are in danger of clipping your highlights. *Clipping highlights* means you have overexposed your image and captured no detail in the highlights. In the latest raw converters, including Adobe Camera Raw (ACR), you can reclaim some highlight and/or shadow detail that initially may appear to be clipped as long as the information was recorded on the sensor. You may be able to regain roughly one stop worth of information from clipped highlights, and two stops worth of information from clipped shadows. This is a huge benefit of RAW over JPEG capture. However, keep in mind that although you can instruct the converter to distribute the information the sensor captured in ways that will maximize the contrast, decrease it, or change the white balance, and so on, what you can't do is re-create information that isn't there. So if you have highlights or shadows with no information, you may be able to lighten or darken them, but you won't be able to re-create detail within them.

That may make it seem that you would be wise to underexpose rather than overexpose, but the fact is that more noise may become visible in the image when it is lightened, as shown in Figure 1.5. For the best results, try to limit lightening in a raw converter to one stop or less. We'll talk more about this issue later in this chapter when we discuss exposing to the right.

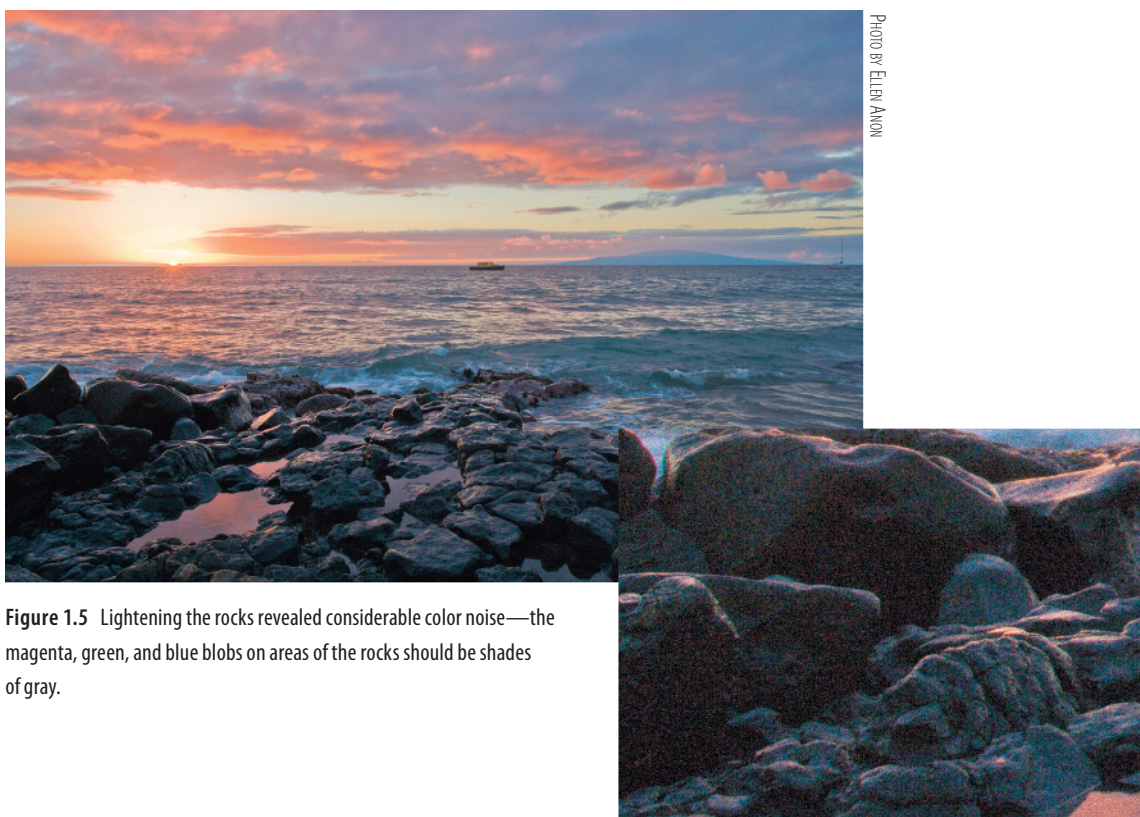


Figure 1.5 Lightening the rocks revealed considerable color noise—the magenta, green, and blue blobs on areas of the rocks should be shades of gray.

In addition to being able to make decisions about parameters such as exposure, contrast, white balance, color saturation, and more in the raw converter, you can even select the color space there. Usually you will want Adobe RGB (1998), which is a wide color space that correlates well to the colors most ink-jet printers can print. When capturing as JPEG files, most cameras use the sRGB color space, which has fewer colors available. sRGB is particularly suited for web use and projection. We'll talk more about color spaces in Chapter 4, "Foundations."

Note: If your camera allows you to select a color space, Adobe RGB (1998) is a good choice for nature photographers.

RAW also offers you the ability to easily fix some problems that occur in some images, such as noise reduction for images taken using higher ISOs, chromatic aberration that occurs with some lenses (resulting in fringing), and vignetting. We'll explain how to identify these potential problems and how to easily minimize or eliminate these issues in Chapter 3, "Adobe Camera Raw."

It used to be that the downside of all this flexibility and capability was that in order to use raw images you had to convert them to a format like TIFF or PSD. Although you still have to convert a raw file before final output, software such as Aperture and Lightroom make it as easy to work with raw files as with JPEGs. We'll talk more about those programs later in this chapter. Additionally, ACR is now so powerful that you can do nearly all your optimizing right in the raw converter within an easy-to-use interface. By using *Smart Objects*, you can place a raw image directly in your PS file and readjust the raw file at will. We'll cover this more extensively in Chapter 5, "Workflows and First Steps."

A downside of shooting in RAW is that you will need a lot more storage space, both in your camera and on your computer, when you capture in RAW than if you use JPEG. Since the cost of storage space has tumbled over the years, this should not be a major hindrance to shooting in RAW. However, keep in mind that if you purchase a new camera when it is first released, there may be a slight delay before programs such as ACR offer support for its raw files.

Advantages and Disadvantages of Shooting JPEGs

Shooting JPEGs does offer some conveniences. For example, even capturing in high-resolution JPEG means you need less storage space; a 4GB compact flash card will make you feel like you can shoot forever. Also convenient is that JPEG images are faster to download, and you may be able to take a burst of more images before the camera buffer fills.

But JPEGs have two *huge* downsides. One is that your camera settings, including color space, contrast, sharpening, white balance, exposure, and saturation, are

applied to your image at the moment of capture. Any changes, even if they're done using the ACR interface, will result in some destruction of pixels and therefore image degradation. In reality, this may often be so slight that it's not noticeable, but it's there. And sometimes the differences may be huge. For example, if you accidentally use the wrong white balance, a JPEG image may be nearly useless at first and at best may require extensive corrections in Photoshop. But the extent of the exposure corrections you'll be able to make will be less because you'll have only an 8-bit image to work with, and extensive Photoshop corrections may result in posterization or noise. Furthermore, as discussed earlier, a JPEG file is compressed lossy, which means that even when you first open it on your computer, it has already thrown away some information the sensor captured when you took the picture. Sometimes this is not noticeable, but at other times it can result in banding and other strange artifacts.

Which is right for you, JPEG or RAW? For most serious amateur and professional photographers, RAW is the way to go. It offers more flexibility and “forgivability” while simultaneously enabling the highest quality of output. If you make large prints and want the best images you can get, RAW is without a doubt the way to go. If limited storage space is your main priority and if you primarily post your images on the Web, email them to friends, and make only an occasional tiny print, then JPEG may be for you. If you plan on selling your images or entering contests, check with your intended clients or the contest rules, because some will require you to provide the original raw file as well as the converted image.

Try It! Shoot a series of images in RAW and in JPEG. Expose them to the best of your ability in JPEG and then use the same settings for the raw version or use RAW + JPEG if your camera has that option. Then shoot one set with an incorrect white-balance setting. Capture a variety of scenes, including some with shadow areas, some with significant highlight areas, and some more average-toned scenes. See whether you can detect a difference in the optimized versions. You may have to wait until you finish a few more chapters so you can optimize both versions of the pictures to their maximum potential for your final decision.

Understanding Histograms

Without a doubt one of the most important advantages of shooting digitally is the ability to check the histogram to ensure you are exposing your images correctly. In the old days—that is, just a few years ago, before digital cameras were common in the field—wherever there was a group of photographers shooting similar subject matter, you'd inevitably hear someone ask, “What are you shooting at?” People felt comfortable with their compositions but always worried about setting the exposure correctly, knowing that as little as 1/3 stop difference could mean the difference between an awesome image and a throwaway.

With digital cameras you can review your shots on the small LCD screen on the back of the camera. Although this may be somewhat helpful for double-checking

your composition and to a certain extent to check for sharpness, the real value lies in displaying the histogram. Get in the habit of checking the histogram in the LCD on the camera back (like the one shown in Figure 1.6). In addition, if your camera has a flashing highlight-overexposure alert feature, be sure to enable it. The alert will cause the area of the picture that appears to have clipped highlights to blink or have marching ants. That way you'll know immediately what areas may not have highlight detail, and you can decide whether you need to modify your exposures.

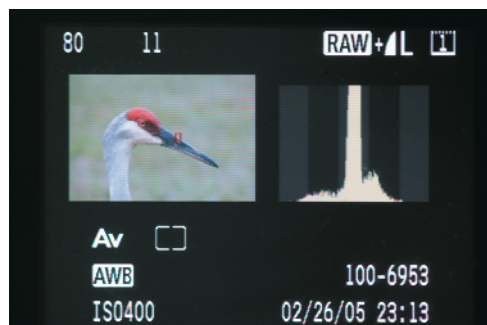


Figure 1.6 The major value of the LCD screen on your camera back is the chance to review the histogram and double-check your exposure.

Note: The highlight alert feature on most cameras is calculated based on a JPEG version of the image using the current camera settings. Therefore it may indicate clipping when the data may exist in the raw file. Use it as a guideline for potential clipping rather than an absolute indication of clipping. Also use it to note what areas of the image are in danger of clipping so you can make an informed decision whether to alter the exposure.

What is a *histogram*? It's simply a bar graph showing the distribution of the tonalities (lightness/darkness) of the pixels you captured in the image. Each pixel not only describes a color value, but also a brightness value. The tonal range extends from pure black (0) on the far left to pure white (255) on the far right, with the different tonalities in between. This means that dark tones are toward the left, middle tones are in the middle, and light tones are toward the right. The higher the peak corresponding to any particular value, the more pixels there are of that particular tonality within the image.

Note: For the sake of convenience, the convention is to describe histograms as extending from 0 to 255, whether for 8-bit, 12-bit, or 16-bit images. In reality, though, the exposure scale of a histogram goes from black at 0 to white at 255 in 8-bit capture; for 16-bit capture, the maximum value is 65,535.

Types of Histograms

Not all histograms are the same. Many cameras display an RGB histogram that is a combination of the pixel values in each of the three channels. This is different from a

luminosity or brightness histogram that other cameras use. The data in a luminosity histogram is a weighted combination of the values in each channel. Still other cameras display histograms that show each channel individually. Each type of histogram has advantages and disadvantages.

Luminosity histograms are easier to use to determine if you have areas within your image that are pure white or pure black, lacking detail. The only time a pixel will register against the far-right or far-left side of a luminosity histogram is when all three channels have a value of 0 or all three have a value of 255. With a luminosity histogram, there is no question that if you have a spike of data on either edge, you have pure black and/or pure white areas in your image, as shown in Figure 1.7.

RGB histograms sometimes look very similar to their luminosity counterparts, while at other times they differ substantially. An RGB histogram presents all the data from each channel, so if just one channel has a value of 0 or 255, you will see data peaking against the edges of the histogram. It will appear that you could have highlights or shadows that are pure black or white when in fact that may not be the case, as shown in Figure 1.8.

RGB histograms may have spikes on the edges when there are no white or black areas because some colors legitimately have one or more channels with values of 0 or 255. For example, pure red is represented by RGB values of 255, 0, 0; pure green would be 0, 255, 0; and pure blue would be 0, 0, 255. Similarly, cyan is 0, 255, 255; magenta is 255, 0, 255; and yellow is 255, 255, 0. But those are not the only colors that use the extreme values of 0 and 255.

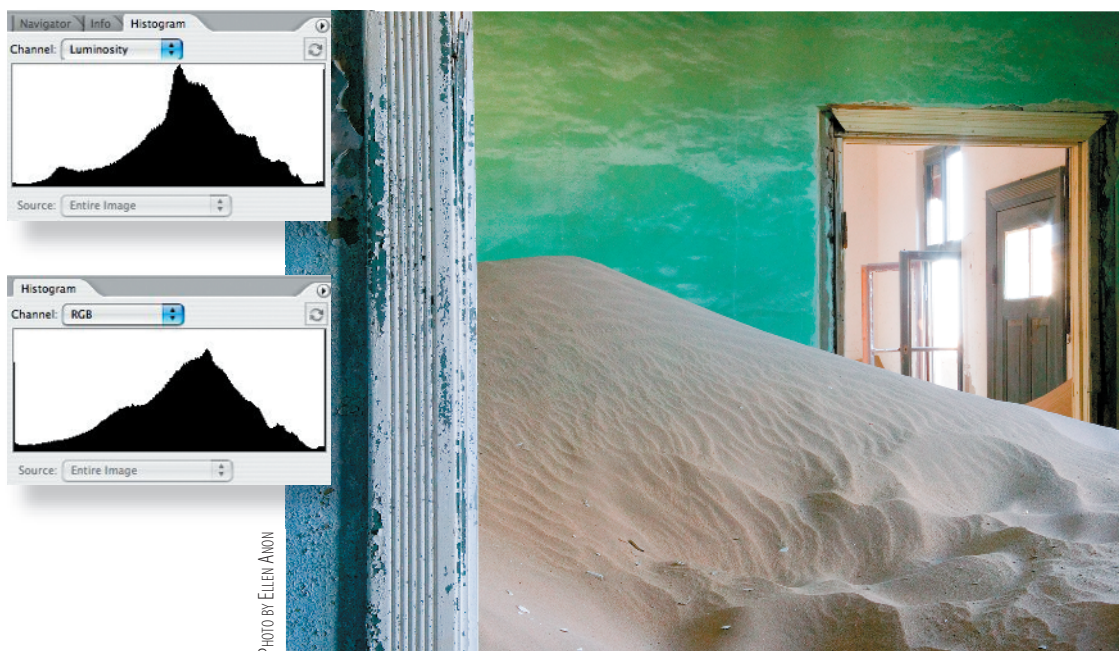


Figure 1.7 When a luminosity histogram has a spike on one or both edges, you can be certain that the image has areas that are pure white, like the windows in this image, or pure black.

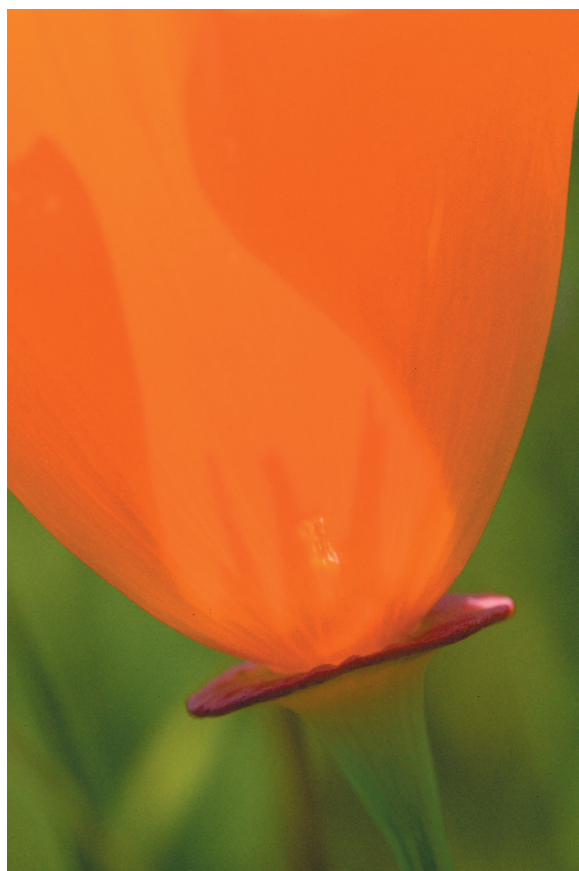


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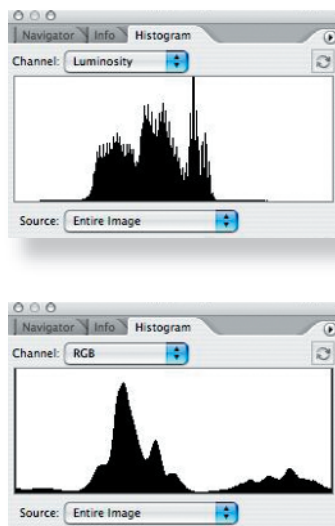


Figure 1.8 If your image contains very saturated colors, the RGB histogram may indicate potential blown-out and/or blocked-up areas, whereas a luminosity histogram will clearly indicate that these areas are not close to being pure white or pure black.

Any color that has a value of 0 or 255 in a single channel will contribute to a spike on the edge of an RGB histogram. For example, the purple in Figure 1.9 has a color value of 132, 0, 189. In an RGB histogram, any pixel that shade of purple will contribute to a spike in the shadows, making it appear as if there are blocked-up shadows when there may not be. That same shade of purple will be represented by data at the point corresponding to a tonal value of 60 in a luminosity histogram...far away from either end of the histogram. Figure 1.9 shows the differences in the histograms for this shade of purple.

That may make it seem like it would always be easier to use a luminosity histogram. The issue is that if you have a subject with very saturated colors, such as a poppy or a bright-red cardinal, in reality the colors vary slightly to allow you to perceive detail in the flower petals or the bird's feathers. So, you need to have the tonal values varying. If a lot of the pixels use values that contain 0 or 255, the chances are that you don't have as much detail in those colors as you may need. A luminosity histogram would give you no indication of any potential trouble, whereas an RGB histogram would clearly indicate potential trouble. By subtracting or filtering the light from an exposure, you may be able to capture those areas of the flower or bird with more detail.

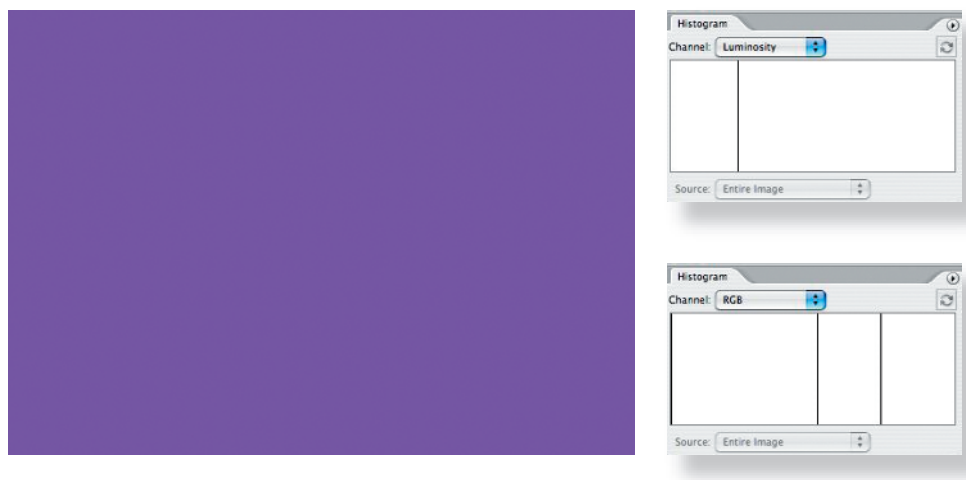


Figure 1.9 A histogram for this shade of purple, which has RGB values of 132, 0, 189, shows that the luminosity histogram has a single line at 60, whereas the RGB histogram is composed of three lines, one at 0, one at 132, and one at 189.

Which type of histogram should you use? That depends on several things, including what information is most helpful for gauging the exposure of a particular image, as well as what histogram options your camera offers. It used to be that most cameras offered only one or the other type of histogram; however, some of the newer models offer a choice. What's most important is to be aware of what type of histogram you're viewing so you will understand precisely what the data is saying.

Interpreting Histograms

Some people mistakenly think that an ideal histogram would be a bell-shaped distribution of pixels. *In fact, there's not a single ideal histogram for all images.* The histogram just reflects the tones in the scene that you are capturing given that particular exposure setting. The ideal exposure for most scenes will yield a histogram that indicates all the data has been captured without any clipping. Let's look at a series of pictures and their histograms.

Figure 1.10 shows a good histogram for an average scene with a full range of tonalities. Note that the pixels extend across the entire histogram, but there are no spikes at either end. Spikes at the ends would mean you have pixels that are overexposed or underexposed and therefore areas with no detail. Since all the pixels fall within the bounds of the histogram, this picture will have detail throughout.

Figure 1.11 shows an underexposed picture. Most of the pixels are in the left portion of the histogram, indicating no light tones. Since you know that part of the pelican is in fact white, a proper exposure would have the pixel distribution moved to the right. If you are shooting a subject with a large light area and you see a histogram that looks like Figure 1.11, you need to add light to your exposure.

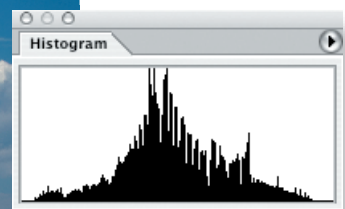


PHOTO BY ELLEN AMON

Figure 1.10 This is an ideal histogram for a scene with a full range of tonalities.



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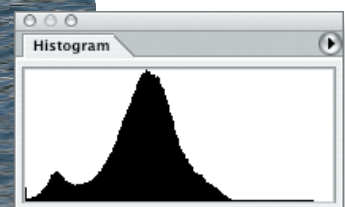


Figure 1.11 This picture is underexposed. Note that all the data in the histogram is skewed toward the left and there are no light tonalities.

Compare the image and histogram in Figure 1.11 with those of Figure 1.12. The latter is a well-exposed picture with an ideal histogram of an overall slightly darker scene with some important bright areas in the subject. If the exposure had been any brighter, the whites might have been *blown out* and lost their detail. *Blown-out highlights* means that no detail has been captured in the brightest areas of the picture. It's another way of referring to clipping. Since we want to retain good detail in the white areas, it's important to safeguard against clipping the highlights. Although in some images the darker portions of the picture may need to be lightened in the raw converter or in Photoshop, if the light areas are part of your subject, you need to expose in a way to make sure you capture the highlight detail. However, if the nearly white portions are in small areas that are in the background or less important places, and the main subject is dark to very dark, it's often better to risk blowing out the highlights, if necessary, to ensure that you capture all possible detail in the dark subject.

Don't get confused between an ideal in-camera histogram for the capture and the final histogram of the optimized image, which may be noticeably different. The goal in-camera is to capture as much information as possible, particularly in your main subject. Once you have the information, you can modify it as you tweak the image, but information you don't capture in the first place is not going to be there no matter what!



Figure 1.12 Images that are somewhat dark but also contain important lighter areas may have histograms that look like this. This is correctly exposed for the raw capture even though the data is slightly skewed toward the left.

Figure 1.13 shows an overexposed image. Note the spike on the right side of the histogram, indicating blown-out highlights. Unfortunately, no amount of Photoshop magic can restore data that was not captured. Checking your camera's histogram regularly and using the highlight alert feature in your camera can avoid the frustration of taking an entire series of pictures like this.



Figure 1.13 The whites in this image are blown out, as indicated by the spike on the right side of the histogram.

Now compare the histogram and picture in Figure 1.13 with those in Figure 1.14. This picture of a polar bear in snow is not overexposed, although most of the pixel data is skewed toward the right. This is the type of histogram you want in this kind of situation—light background and light subject with minimal dark areas.

Figure 1.15 shows a histogram of a high-contrast scene. It has a spike on the left side of the histogram, although the data extends through the tonalities all the way toward the right of the histogram. There is no way to capture this scene in a single shot at this time of day without losing either some highlight detail or some shadow detail. Ordinarily it's better to preserve the highlights and sacrifice some shadow detail, as was done in this image. An alternative appropriate for some situations, which we will discuss later, is to shoot multiple exposures and combine them in one image.



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Figure 1.14 A light subject with a light background will have a histogram that is skewed toward the right.

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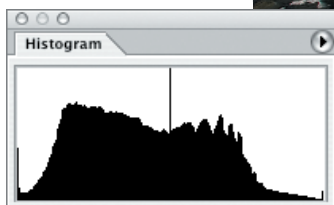


Figure 1.15 This scene has too much contrast to capture perfectly in a single shot. The spike on the far left of the histogram shows that there is some loss of information in the shadows, but you can see that the highlights have been preserved. (Note that the small spike on the right is just before the end of the histogram.)

Finally, let's look at the histogram of a silhouette in Figure 1.16. As you may expect, the far-left side of the histogram shows a spike, but in this case, it doesn't mean the image is underexposed. On the contrary, we want silhouettes to be pure black! Sometimes when you shoot a silhouette, the spike won't be all the way toward the left. The reason for this is you will need to expose the image so that you capture the most detail possible in the rest of the image. This will mean exposing to the right (which we'll discuss later in this chapter) even if the silhouette is then too bright. It's a simple matter to darken the silhouette in the raw converter or in Photoshop. By exposing to the right and then darkening part of the image, the darkest tones will have less noise.

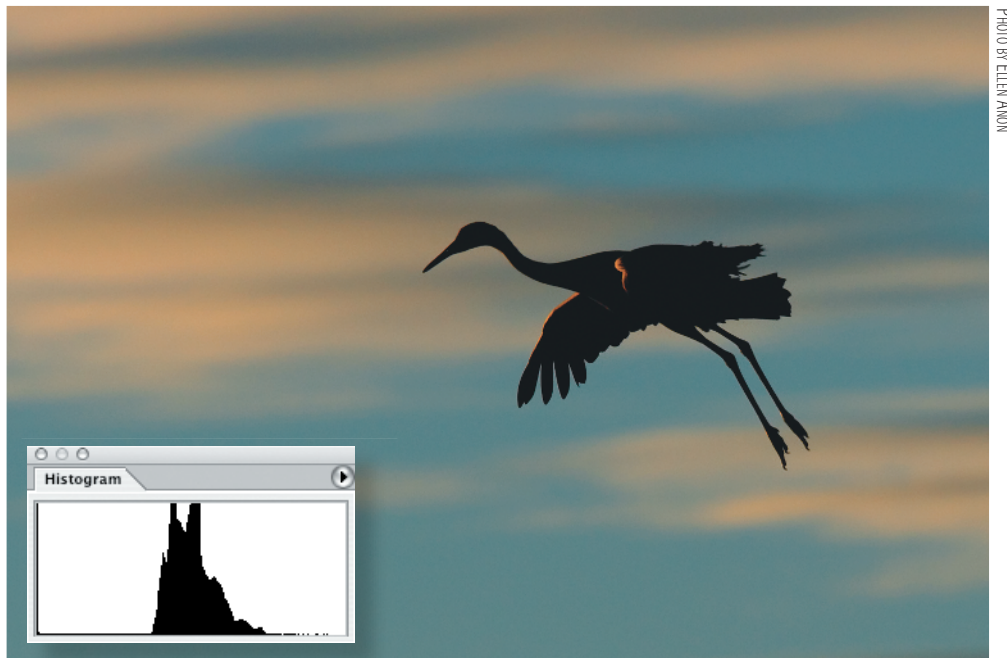


Figure 1.16 Silhouettes will often have histograms that have a thin spike on the left edge, indicating areas of pure black.

The bottom line is that there is no single ideal histogram for every situation. You have to think about the tonalities in your image and where they should fall on the histogram to know what is ideal for any particular situation. It's important to make sure you don't have spikes at the extreme ends of the graph, since that could mean shadow or highlight areas without detail. However, when the lighting has so much contrast that you can't avoid spikes on one or both ends of the histogram, you must consider the tonalities of your subject and preserve as much detail as possible in the subject. If necessary, you can forgo some detail in the background. Normally the order of priorities is to preserve detail in the subject; don't clip the highlights, even in the background; and maintain shadow detail, including in the background. If your subject has a very dark area and the background has bright areas—such as bright clouds—you may opt to maintain the detail in the dark areas of your subject at the expense of the detail in

the clouds. Of course, if you are shooting a silhouette, a spike at the left side of the histogram indicating black for the silhouette is acceptable, while any specular highlights may be fine as pure white. (*Specular highlights* are those extremely bright areas that occur when the sun reflects off water or metal or other highly reflective surfaces. We expect those areas to be pure white without detail.) But for most images, in order to capture detail in both the shadows and the highlights, you want the tonalities to fall within the boundaries of the histogram.

Note: Some photographers new to digital and Photoshop think they don't have to worry about exposure anymore because they can "fix it" later in Photoshop. The harsh reality is if you blow out the highlights or totally block up the shadows, the only "fix" will be to clone in pixels from other areas. Photoshop gives you lots of ways to tweak the exposure, which we'll explain in Chapters 3, "Adobe Camera Raw," and 6, "Exposure Adjustments," but if the data isn't there because of overexposure or underexposure, Photoshop isn't going to create it for you.

Exposure

If you check the histogram and see that you have a spike at the far right and room on the left side, you need to modify your exposure to have less light. If you are shooting in Aperture Priority, you may choose to put in some minus exposure compensation, or if you are using manual mode, either use a smaller aperture or increase your shutter speed. Because you're shooting digitally, you have a third option—to switch to a slower ISO. Although you still need to set the correct exposure, you can use the same depth of field/aperture setting as you originally wanted (perhaps in an effort to keep the background out of focus) and/or the same shutter speed (perhaps in an attempt to blur your subject).

Similarly, if the histogram is indicating a spike at the black end and has room on the right side, you'll want to add light via plus exposure compensation, slower shutter speeds, wider apertures, and/or possibly a faster ISO to allow you to use the desired apertures and shutter speeds. Faster ISOs—those with the larger numbers—mean that less light is required to hit the sensor to achieve the proper exposure. The problem with this is that the faster the ISO, the more noise the picture may have. Some cameras have less noise while using higher ISOs than do other cameras. Test your own camera to determine the highest ISO you can use without noise becoming an issue. (Keep in mind that longer exposure times also contribute to noise.) When using a higher ISO, be extra careful not to underexpose your image, because when you go to lighten it the increased noise will become apparent. In general, use the slowest (smallest number) ISO that you can. We usually leave our cameras set to ISO 200 and change the ISO according to the situation.

Note: Usually, the lower the ISO, the less noise you will encounter. Noise is in many ways the digital equivalent of film grain, except that it tends to be more evident in darker shadow areas. It appears as variations in color and tonality in areas that should be smooth.

Technically, not only should the ideal histogram for a raw image contain all the pixels with no spikes at either end, but also it should be exposed as far to the right as possible with no blown-out highlights. This is to obtain the best signal-to-noise ratio possible. (It is important to keep in mind that this applies to raw images but not to those captured as JPEGs because the main benefits occur in the process of the conversion. If you are shooting in JPEG, make the most accurate exposure you can, and make sure you're not clipping data on either end.)

Throughout this book, we've asked some of the top nature photographers in the world to share some of their insights and favorite tips for using Photoshop effectively. Michael Reichmann does an excellent job of explaining proper exposure, so we asked him to share that explanation with you. The following section, "Expose Right," was written and contributed by him. For more information on Reichmann and his work, please visit his website, www.luminous-landscape.com.

"Expose Right" by Michael Reichmann

In the beginning there was the light meter. Photographers used them and saw that they were good. Then there was through-the-lens metering, and the people rejoiced. Automatic exposure followed, and photographers thought that the millennium had arrived. Eventually the millennium actually did arrive, and with it digital cameras with histogram displays; and the world changed again.

What hasn't changed over the years is the need for accurate exposure, which all of this technology is ultimately in aid of. But what constitutes proper exposure is quite different between film and digital. In this section, you'll see why, and how to take best advantage of it.

Don't Blow It

Digital is very much like color slide film in that you want to avoid overexposure. Although it's often possible to recover some information from the shadows of an underexposed digital image (especially if a low ISO is being used), if the image is overexposed so that no highlight detail is captured on the sensor, there is no information to be retrieved. The individual photo sites or pixels have simply recorded 100 percent of the information that they can absorb, and this is a featureless white.

This would lead most people to think that the best thing to do would therefore be to bias their exposure toward the left of the histogram—toward underexposure. This would avoid the risk of blown-out highlights, and since it's often possible to retrieve detail from underexposed shadow areas, what have you got to lose?

A lot, actually, as you'll see.



Signals and Noise

Digital uses very tiny photo sites—sensor elements made of silicon that are sensitive to light. Essentially, if no light hits a sensor element, no voltage is generated and a value of 0 or black is recorded. If the sensor element is flooded with light (overexposed), it records a maximum value of 255 and a corresponding voltage level is produced. Light levels in between are recorded as some value between 0 and 255.

Although silicon doesn't suffer directly from what we describe as grain in film, it does have a comparable issue. This is described as *noise*. Noise in this context is any form of non-image-forming energy (light is just one form of energy). Various things can cause noise to be recorded by the sensor. These include heat, cosmic rays, and several other exotic sources. All silicon chips have an inherent noise level. As a percentage of the total signal being recorded, it is usually quite small and unnoticeable. But it's always there, and depending on the exposure being recorded, it can become visible and annoying. This is somewhat akin to the noise that one sees on a TV screen when there's no channel broadcasting or antenna attached.

Note: We authors interrupt to add that usually the energy that causes noise is low enough in its intensity that it falls to the left (dark) side of the histogram.

This is where what we call the sensor's *signal-to-noise* (s/n) ratio comes in. If there's a lot of signal (data on the right side of the histogram), then the s/n ratio is high, the signal predominates, and the noise isn't visible. But if the signal is low (on the left of the histogram), then the s/n ratio is low, and you see the noise because it represents a relatively high percentage of the total signal present.

So, the solution is clear. Take a photograph, check the instant review histogram, and make sure that the exposure is as far to the right of the histogram as possible without touching the right edge.

Dynamic Range and Bit Mode

The concept of *bit mode* is important to properly understanding digital image quality. Assume for the purposes of illustration that a digital SLR camera has a dynamic range of five stops. (It's usually closer to six stops, and may be as high as seven or eight stops of usable information for some newer cameras, but for the sake of illustration, we'll use five stops.) When working in raw mode, most cameras record a 12- or 14-bit image. (Yes, we say it's in 16 bits, but the reality is that the camera is recording only 12 or 14 bits of information in a 16-bit space. This is better than 8 but not as good as a real 16 bits would be.)

A 12-bit image is capable of recording $2^{12} = 4,096$ discrete tonal values in each component. You would therefore think that each f/stop of the five-stop range would be able to record some $4,096 \div 5 = 820$ of these steps. But, alas, this is not the case. The way it really works is that the first (brightest) stop worth of data contains 2,048 of these steps—fully half of those available.

Why? Because CCD and CMOS chips are linear devices. And, of course, each f/stop records half the light of the previous one and therefore half the remaining data space available. Table 1.2 tells the tale.

► **Table 1.2** Where Light Levels Are Stored on Chips

| F/stop | Number of Levels Available |
|---|----------------------------|
| Within the first f/stop, which contains the brightest tones | 2,048 |
| Within the second f/stop, which contains bright tones | 1,024 |
| Within the third f/stop, which contains the midtones | 512 |
| Within the fourth f/stop, which contains dark tones | 256 |
| Within the fifth f/stop, which contains the darkest tones | 128 |

This realization carries with it a number of important lessons, the most important of them being that if you do not use the right fifth of the histogram for recording some of your image, you are in fact wasting fully half of the available encoding levels of your camera.

But we all know (or at least should by now) that the worst sin in digital imaging is to blow out the highlights. Once they're blown (past the right edge of the histogram), it's bye-bye data.

The Lesson

The simple lesson to be learned from this is to bias your exposures so that the histogram is snuggled up to the right (as illustrated in Figure 1.17) but not to the point that the highlights are blown. This can be seen by the flashing alert on most camera LCD screens. Just back off so that the flashing stops.



Figure 1.17 A normal exposure shows a centered histogram (left). This histogram is shifted to the right for maximum signal/noise ratio (right).

Now when you look at the raw file in your favorite raw-processing software, such as ACR, the image will likely appear to be too light. That's OK. Just use the available sliders to change the brightness level and contrast so that the data is spread out appropriately and the image looks "right." This accomplishes a number of goals. First, it maximizes the s/n ratio. Second, it minimizes the posterization and noise that potentially occurs in the darker regions of the image.

Please be aware, though, that for proper results you need to make these corrections while working with a 16-bit (14-bit) raw file in a raw converter. Unlike what some people think, in raw mode the camera is not doing any nonlinear processing. All nonlinear processing takes place in the raw converter. This is why if you're going to try this trick, you must shoot in RAW and then manually readjust the image in the raw converter before exporting the file into Photoshop and possibly then converting it to an 8-bit file. By doing this, you'll be maximizing the data bandwidth of your entire system.

Also be aware that by doing this, you are in fact effectively lowering the ISO used to capture the image, requiring slower shutter speeds and/or larger apertures. If you are holding the camera by hand or shooting moving objects, the trade-off may not be worth the reduced noise level.

But, if ultimate image quality is your goal and you have the ability to control all the variables, *exposing to the right* is a technique that will serve you well.

White Balance in Nature Photography

With film cameras, you use specific types of film according to the lighting conditions, and you use filters to further control the color casts. With digital, you have a somewhat equivalent but far more flexible choice, which is white balance. As you know, the color (or temperature) of light varies throughout each day. It's a "warmer" color in the morning, and the world takes on a reddish/yellow glow. Your eyes adapt to that and compensate because you know that white is still white. (Think about when you put

sunglasses on and a few minutes later the colors look “normal” again.) Later, when the bright sun is overhead, the color appears “cooler,” or bluer. Your eyes continuously adapt so that you see neutral colors as neutral, and most people are rarely aware of color casts.

Cameras are more literal—they record the colors exactly as they see them. With digital cameras you can use the white balance setting to render the neutral tones (any shade from white to black where the red, green, and blue values are all the same) as neutral, rather than rendering them with a color cast. For example, you need a different white balance in the cool bluish light of an overcast day than in the warm reddish light of a sunset. Nearly all digital cameras offer an automatic white balance setting in which the camera makes a best guess as to the correct lighting temperature. Surprisingly, most do quite a good job, as shown in Figure 1.18.



PHOTO BY ELLEN ANON

Figure 1.18 Auto white balance was used to capture this photo in the warm light of early morning.

Some photographers think the best way to be certain of getting the correct white balance is to set it themselves. However, most of these photographers are content to use one of the presets supplied with the camera, such as Flash, Sunny, Cloudy, Shade, Fluorescent, and so on.

If you don't use Auto White Balance and you shoot JPEGs, you must be vigilant about changing lighting conditions and altering your white balance accordingly. As you can see in Figure 1.19, if you use the wrong white balance setting, your picture may have a strong color cast. If you shot the image in RAW, you can easily correct this during the conversion process; but if you shot it in JPEG, a mistake like this could ruin the image.



Figure 1.19 The white balance here was accidentally set to Tungsten. A mistake like this can be deadly if the image is shot in JPEG.

If you’ve ever gotten up before dawn to go out and photograph in the beautiful, warm, early-morning light, you know that nature photographers aren’t always seeking to make neutrally colored images. Often, nature photographers want a color cast in their images, particularly a warm cast, as shown in Figure 1.20. This is one of the reasons we prefer to shoot in raw mode; we don’t have to make a final decision about the precise white balance until we’re converting the image, whereas with JPEG mode, the white balance is “baked” into the image. We retain the option to set the final white balance to be as accurate as possible or to set it to reflect the mood we want to portray rather than the exact lighting conditions at the time.

If you are shooting in JPEG, you may want to experiment with using the auto white balance feature, along with setting the white balance specifically. You may not only want to set the white balance for an accurate rendition of the scene, but you may also want to experiment a little. For example, if you use the Cloudy or Shade setting in fairly sunny conditions, it’s similar to adding an 81A or 81B filter to your camera lens; these settings will add a warm cast to your picture. Product photographers must be concerned with absolute color accuracy in their photography. Nature photographers have the luxury of being able to be creative with the white balance and create, augment, or remove color casts as it suits their vision. You can use the white balance settings rather than filters to do this both with JPEG and with RAW.

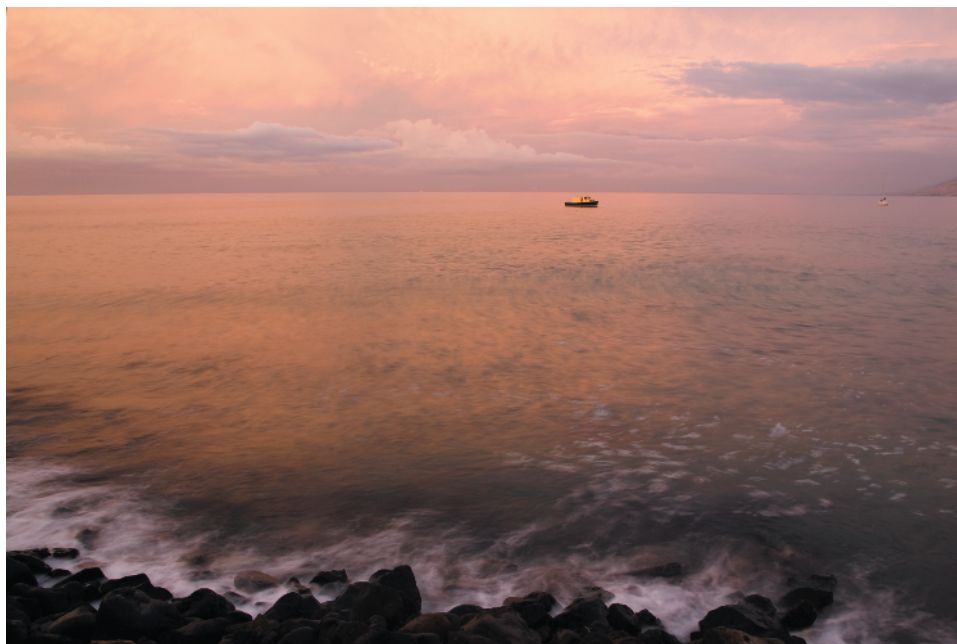


PHOTO BY ELLEN ANON

Figure 1.20 This picture, taken at dawn, actually has a warmer, pinker color cast than what existed at the time, but the result is pleasing. Altering the white balance lets you convey a mood effectively.

When you capture your images as raw files, because the white balance you selected in the camera is not actually applied until you convert the image, you have the luxury of time to adjust the white balance as you want. Most raw converters provide continuous temperature and tint sliders to set the white balance that best fits the mood of the image. You can tweak it in small increments to precisely obtain the effect you want. Because of this, many photographers elect to leave their cameras on auto white balance and then use the sliders in the converters to impart or remove color casts. Others still select what they believe is the best white balance setting while in the field so they can recall what the lighting was and how the image actually appeared. They prefer to have their images be as close to accurate, realistic color as possible. Who's right? Both are! It's a matter of your personal goals and preferences with your photography.

Note: If you are using auto white balance, using a warming or cooling filter may have no effect, because most cameras will compensate for the filter and try to make everything neutral!

Color Management

For any photographer, achieving accurate color is a key concern. You need to know that the way the image looks on your monitor is how it will look when it's output.

While you may take artistic license in how you optimize an image, you want to ensure that a print or image you show in a slideshow or on the Web is an accurate reflection of your interpretation of the image. That means producing output that matches the monitor display to the extent possible. This is the job of color management, and it can help you achieve greater consistency in your workflow. The workflow and settings we recommend throughout the book will help you establish a color-managed workflow.

Monitor Calibration

The first step in a color-managed workflow is to calibrate and profile your monitor. We can't stress how important this is. If you don't have a calibrated display, the images you are evaluating and optimizing are likely to be at least slightly—and possibly significantly—inaccurate. They might look good to you on your monitor, but your prints are unlikely to match what you see. If you don't calibrate your monitor, you also have no valid reason to complain about prints that don't match your monitor. Calibrating your monitor is a critical first step to producing the results you are looking for with your images.

As far as we're concerned, calibrating your monitor is done properly only by using a package that uses a colorimeter (a type of sensor) to measure the color values of your monitor so that appropriate compensation can be applied (see Figure 1.21). There are several packages available that include a colorimeter, and we're perfectly comfortable with any of them. We asked Jon Canfield, an expert on color management, to describe some of the current devices.



Figure 1.21 For monitor calibration, use a software package that includes a colorimeter to measure the color behavior of your monitor and apply compensation to ensure an accurate display.

Color-Management Essentials

by Jon Canfield



PHOTO BY JON CANFIELD

Having a calibrated monitor is a critical part of the digital workflow. There are plenty of options, from the free Adobe Gamma on Windows (included with Photoshop in the Extras folder), to the Color Calibration Assistant that ships with Apple's OS X. Both of these programs let you make adjustments to your display by visually comparing different color patches. While this is better than nothing, it's far from ideal.

The best option is hardware calibration. These small devices measure different colors directly from the screen with a colorimeter, evaluating them for accuracy. Once this is done, a profile is created that sets your monitor to the optimum settings. At the low end in cost is the PANTONE huey. At less than \$100, it does a good job of calibrating your monitor and has a feature to adjust the display as the ambient light changes. The next step up in accuracy and options are the X-Rite i1Display 2 and the Datacolor Spyder3Elite. Both of these devices give you the option to set color temperature and gamma. By using more color patches, both of these tools can create very accurate profiles. Expect to pay approximately \$250 for either of these products. The final option is a spectrophotometer, which can also create printer profiles. Your choices here include the X-Rite ColorMunki, the Spyder3Studio SR, and the i1Photo. The ColorMunki is a recent addition to the field and can profile monitors, printers, and digital projectors as well as do spot color measurements. If you use specialty papers, at less than \$500, the ColorMunki can easily pay for itself with custom profiles. It's priced substantially less than the i1Photo.

Note: Although Adobe Gamma is no longer installed by default in PCs, it may still be in your Startup folder if you are using an older version of the OS. If it's present, it overrides any custom profiles you try to use. To remove it, do the following:

1. Click Start.
2. Select All Programs.
3. Select Startup.
4. Right-click on Adobe Gamma and select Delete.

Working Conditions

A calibrated monitor display ensures *accurate* color (to the greatest extent possible) but doesn't ensure *consistent* color. That may sound a bit contradictory, but it emphasizes the importance of working under consistent conditions. As a nature photographer, you are well aware of the considerations of good lighting. You look for optimal conditions, with the sun at an optimal angle to produce a golden glow, for example. Just as varying lighting conditions can affect both the appearance of your subject and the ultimate quality of your photos, the conditions under which you work can affect the appearance of your monitor display. Different ambient lighting conditions will cause you to perceive the colors and tonalities differently on your monitor.

It is very important that you work under lighting conditions that are as consistent as possible, and ideally somewhat dim. The monitor you are using as the basis of all your evaluations about an image emits light, and your perception of that light can be influenced by the light in the room. If the room is too bright, you won't be able to see subtle details on the monitor. If the light isn't relatively neutral, it can have an effect on the color appearance of the monitor display.

The ideal situation is to work in an environment that is consistently somewhat dark. That doesn't mean you need to work in absolute darkness. It just means that you want to minimize the lighting to the extent you are comfortable with, and do everything you can to ensure the lighting is neutral and remains consistent from one session to the next. If you work on an image with early-morning light filling the room and making the image on your monitor look warmer than it really is, you may overcompensate by adjusting the image to look too cool.

If you can minimize the amount of artificial light in the room, perhaps by using a dimmer to keep the light at an appropriate level, that is an excellent start. If you have windows in the room where you're working on your images, it is a good idea to close the blinds (or install blinds) so you can minimize the influence of outside light.

The bottom line is that you want to be working in an environment where the monitor is accurate by virtue of the fact that it has been calibrated, and is consistent because your working conditions are likewise consistent. This helps ensure that you are seeing accurate color on your monitor, which is the reference both for adjustments you're making to your images and for evaluating the accuracy of your prints.

Photographing Images to Composite Later

How many times have you looked up and commented on the great clouds or beautiful sunset but not taken the picture because foreground elements were missing? Or the opposite—you found a great subject, perhaps a bird posing wonderfully or a gorgeous scene, but the sky or background was completely blah? Or you could tell there was just too much contrast to be able to capture the picture in a single shot? When you are in the field with your camera, it's important to remember that Photoshop enables you to combine images in a seemingly infinite variety of ways. You have to adjust your thinking to include seeing the potential for an image.

Expanding Camera Capabilities

Sometimes you see a situation and know that you can't capture it in a single shot because of the technical limitations of your equipment. Photoshop provides ways to combine shots to create images close to what you can see but that are not possible to capture with a single exposure.

Your eyes can see a much greater range of tonalities than can your camera, where the dynamic range is limited to five to six stops of lights for digital captures and slide film. This means although your eyes may be able to see detail in both the high-lights and the shadows in a scene, today's cameras may not be able to do so within a single exposure. The solution is to take a series of exposures, making sure you capture detail in all parts of the pictures. This could mean two or more exposures varying at least one stop each.

Dynamic Range and HDR Images

It's helpful to understand exactly what "dynamic range" means and what constitutes an HDR image.

Dynamic Range The range between the brightest and darkest points of an image.

High Dynamic Range (HDR) Images An HDR image contains a far wider dynamic range than can be displayed on a screen or printed on a printer. HDR images are often created from multiple exposures of one scene and are stored in special file formats. They are of interest to photographers because you can convert them back to 8-bit or 16-bit images and compress the dynamic range, allowing you to create images with detail in both shadow and highlight areas of an image, more like what your eye saw when looking at the scene or possibly even with more detail than you're usually aware of seeing.

If you're dealing with a static subject and shooting from a stable platform, you can take a series of exposures to later combine using Merge to HDR to create a 32-bit file. This file is called a *high dynamic range (HDR)* file, and we'll discuss it more in Chapter 8. In addition, there are several other ways to combine 16-bit exposures

within Photoshop to extend the latitude. So even if your subject matter is not completely static, take two or three exposures: one that captures all the detail in the shadows, one that captures all the highlight detail, and possibly one for the midtones. Be certain to keep your camera in precisely the same spot, and don't change the focus or aperture between the exposures; vary only the shutter speed. Chapter 8 will explain several techniques to put these pictures together to create a picture with at least as much detail as your eyes are accustomed to seeing.

Photographing Parts of the Scene Individually

Another limitation of your camera sometimes arises when you need more depth of field and shutter speed than what the amount of light will allow. This happened to Ellen in Bosque del Apache, New Mexico, when she saw the beautiful mountains and sunset in the distance with the cranes flying fairly close to her. Although she could see it, there was no way to capture the entire scene with adequate depth of field to have the cranes in focus as well as the mountains and have enough shutter speed to freeze the motion of the birds. Her solution was to photograph the birds in one frame and the background in another. Then she combined the two in Photoshop, as shown in Figure 1.22. In reality, the moon was behind her while taking those shots, but in the end she decided to add it to the picture because she wasn't trying to create a documentary image but, rather, one that captured how it felt to be there. Photoshop made that possible.



PHOTO BY ELLEN AMON

Figure 1.22 There was no way to capture the birds and the mountains in a single shot because of the low light levels. Instead, individual shots were combined in Photoshop.

Image Components

Some nature photographers prefer to create only images that literally convey what they saw, which is fine. However, others are looking to create artistic renditions of what they saw and may want to add elements to their images. A number of situations lend themselves to photographing parts of a picture that you will later combine in Photoshop. You can create libraries of these image elements to use at some later time.

Perhaps the most obvious elements to store are skies and moons. Whenever you see a dramatic sky, photograph it! Place the images in a special folder labeled “skies,” and keyword them with the word “sky.” You’ll need more than one replacement sky, because one of the keys to creating believable composites is to match the direction and quality of the lighting. Sunsets are great to photograph, as are clouds—the blue-sky-with-puffy-white-cloud types as well as the impending-storm types. When you start paying attention to clouds, you’ll soon see that different types of clouds tend to occur more in certain seasons. By having a collection of skies, when you find a great subject (perhaps that leopard in the tree while in Africa) or a beautiful scenic landscape, you’ll be able to remove the distracting white sky and make it appear that luck was with you in the field.

Figure 1.23 shows a picture that could have occurred but didn’t. Capturing all these landing cranes in one shot was wonderful, but unfortunately the sky behind them was boring. A few minutes earlier, the sky in the very same spot had been dramatic, but there were no birds. This image is a combination of the birds with the sky that had been there a few minutes earlier.



PHOTO BY ELEN AMON

Figure 1.23 Sometimes nature doesn’t cooperate and gives you a great subject but a boring sky, or vice versa. In Photoshop you can combine them to have the best of both worlds.

Don’t limit yourself to just skies and clouds, though. You can add all sorts of elements to pictures to add impact or create a sense of your own style. It can be helpful, for example, to keep a folder of moons to use as accent elements in pictures. You can shoot full moons, crescent moons, moons against black skies, and moons in daylight skies. You’d be amazed at the variety of color casts in the moons. Then when you think a picture needs a little extra pop, you can put one in. (We’ll explain how to do that in Chapter 8.) Sometimes you might make them a realistic size, and sometimes

you might enlarge them. A photographer we know adds boat docks, and so he has a collection of docks to add to scenic water pictures. You're the artist, and the choice is yours. Use your imagination, and keep your eyes open for other elements to collect to add to your images.

When photographing something that you're likely to want to later extract from the picture and use elsewhere, try to design your photograph to make it easier to remove the desired object. For example, it will often be easier to remove an item from a blurred background than from a cluttered one, so consider using a wide aperture. You may need to take a step or two left or right or perhaps get down a little closer to the ground to help separate intricate background objects from your subject. A little care in the field can make your work in Photoshop much easier!

Be sure to store these photo elements in a consistent place that's easy for you to find. You don't want to have to look through all your pictures to find them. Of course, adding keywords to them will also make it easy to locate them when you need them.

Ethical Considerations

Is the image manipulated? It sounds like such a straightforward question. But answering honestly may be more difficult than it appears, especially when responding to people not well versed in digital photography.

If you shoot in RAW, you essentially have a negative that needs to be processed during conversion. The settings you apply determine the appearance of the image, but these really aren't manipulating the image any more than chemicals do in a dark-room. Similar adjustments done in Photoshop, as opposed to in the raw converter, are considered by some to be manipulations. Many accept that it is necessary to clone out dust and to perform some sharpening since there is some slight softening of digital images by their very nature. A few people are bothered by basic exposure and color modifications, but most accept this as part of the processing, as long as the overall intent of the capture remains the same. Modifying the colors or tonalities within only a section of the image is more troublesome for some, and such changes are prohibited by some contests. If you enter your image in a contest, be sure to follow their rules for what changes are and are not permitted.

Although cloning out dust is usually acceptable, there is debate about how much of an object one can clone out before the image is considered manipulated. Sometimes it's more environmentally responsible to clone out an object rather than remove it in reality (see the sidebar "Removing Objects in the Field or Later in Photoshop" for more on this). Sometimes it's impossible to remove it in reality. Unfortunately, for some this crosses the line into a manipulated image. Maybe it's an area that needs to be thought through more carefully.

Many gray areas exist. For example, it's common practice when photographing hummingbirds at feeders to put up a man-made background so that the birds are photographed against a pleasing, nondistracting background rather than clutter. This is acceptable. But if you took the image photographed with the cluttered background and, in Photoshop, replaced the background with a simpler one, many would insist the image is manipulated.

Our feeling is that when we composite elements within an image, the image is manipulated, and we're careful to indicate this whenever reasonable. When asked, we respond honestly, and label images accurately. The bottom line for us is that photography is an art form, and our goal is to create images that express what we feel. For those who are more inclined toward scientific documentary types of nature photographs, the lines may be different. You have to decide what's right for you!

Removing Objects in the Field or Later in Photoshop

There's an old adage that reminds us to "Take only pictures and leave only footprints, and barely those if possible." But as nature photographers, we know that sometimes there are distracting elements that interfere with our pictures. There may be an ill-placed stick, a wayward branch, or maybe a rock that's too light and bright. It seems harmless enough to move it and create a cleaner photo. Many times doing so may be fine. But have you considered that perhaps that rock or branch was serving a purpose to one of the many critters in our world? Perhaps the branch provided some protection against the wind or shielded visibility from a predator; maybe the rock provided a safe resting spot while looking for food. We know and see the world through our human perspective, and what seems inconsequential to us may have a significant impact on a variety of wildlife.

Does that mean you should never move anything in the environment? That would be an extreme and unrealistic position, but the reality is you may want to consider whether it would be smarter to remove the offending item later in Photoshop. Although it may create more work for you, you will be creating less stress on the nature around you. You have to use common sense in making this choice. (We'll cover how to remove objects in Photoshop in Chapter 5.)

Aperture and Lightroom

A few years ago the software choices for digital photography were fairly limited; Photoshop and Photoshop Elements dominated the market for quite a while. Many photographers, amateur as well as professional, have based their workflows entirely on using Photoshop or Elements for years. In fact, both offer good workflows (which are what we're teaching you throughout this book), but they're not perfect. Photoshop was developed not only for photographers, but also for graphic artists. The result is that it has numerous features that photographers don't need. And there are some features that photographers need but that Photoshop doesn't do quite as well as we wish. For example, Photoshop is not an image-management device; it doesn't help you keep track of where you've stored the images. (Eventually, if you shoot enough, you can't keep all your images on your computer's internal hard drive—you must export them to external hard drives or gold DVDs, and so on.) Further, because Bridge is a separate program from Photoshop, you actually encounter three different user interfaces—Bridge, Camera Raw, and Photoshop. This can be confusing for some and is a little

time-consuming as you go back and forth among them. Additionally, you can't email images directly from Photoshop.

Apple introduced Aperture in late 2005, and this release was followed shortly by Adobe's announcement of a beta version of software called Lightroom. These newer programs are designed from the ground up to meet the needs of photographers. In addition, they make working with raw files virtually indistinguishable from working with JPEGs or TIFFs. No separate converter software or interface is needed. Now that these programs have advanced, you can do many of the things that used to require Photoshop or Elements, but you still can't composite images in those programs (an exception is that there are plug-ins for Aperture that enable you to create HDR images without Photoshop).

Aperture and Lightroom are designed to make your workflow easy and efficient from the moment you download images from your camera through locating your best images and showcasing them to others. When you connect your camera or card reader, an import window appears and nearly instantaneously so do low-res previews of your images. You choose where to store these images and how to name them. In addition, you can quickly add any metadata you choose, such as basic contact information and keywords. After importing the images you can easily edit them, using a magnifying loupe to check for sharpness and details—and comparing similar images side by side.

In Aperture, most of the adjustments you're likely to need to make can be present in the same user interface you use to sort through your images, whereas in Lightroom you proceed through different modules. This is why many people find Aperture slightly more efficient to use. You can save commonly made adjustments as presets, or you can adjust the sliders to tweak all aspects of the exposure and colors. These adjustments are stored as instructions while the master file remains untouched. The adjustments go beyond those typically available currently in most raw converters and include all the expected features as well as an outstanding Highlight/Shadow tool, individual color controls, sophisticated Retouch tools (in Aperture), toning, and more.

If you opt to use Aperture or Lightroom, you're likely to find that you will not need to use Photoshop for all your images. You'll still need Photoshop when you have more complicated cloning to do, when you want to create composites, or when you want to use any of the filters available in Photoshop. When using Aperture or Lightroom, if you want to open an image in Photoshop, it's just a keystroke away. The image will open in Photoshop, and you can make the desired changes. When you're done, you click Save, and Aperture or Lightroom will automatically update the image preview to reflect the changes you made in Photoshop. You can save all your layers when you work in Photoshop, and although the individual layers are not accessible from within Aperture, if you reopen that same file in Photoshop all the layers will still be there.

Aperture provides equally efficient methods for creating slide shows, sending emails, creating books, creating websites, sharing images, uploading images to your mobile phone, and making prints. We've adopted Aperture as our primary workflow tool. Lightroom provides many similar functions, although it is not quite as

streamlined in some cases (such as emailing photos). Lightroom has the advantage, though, of being available for both PC and Mac, whereas Aperture is a Mac-only application. One of the main disadvantages of Lightroom, in our opinion, is the need to change modules depending on what task you're doing. That makes the initial edit through your images slower.

If you opt to adopt Aperture or Lightroom as the basis of your workflow, you'll find that you make many or all the global exposure and color changes we discuss in this book in those programs. You'll still find it advantageous to work in Photoshop for some tasks. For example, if you use Lightroom, it's likely that you'll still use Photoshop for most of your cloning. We also use Photoshop at times when we want to make a change to part of the image and not have it affect the rest of the image—which means when we'd like to use a layer mask. In earlier versions of Photoshop, we used layer masks a lot. With the latest raw converters offering localized controls, we don't use layer masks quite as often as we did in the past, but we most assuredly still use them. The ability to make a change and have it affect only the targeted area gives you precise control over the final appearance of your images. We also use Photoshop when we want to use any of its filters as well as for all types of creative ventures, including creating composites of all types. Even if you use Aperture or Lightroom, it's worthwhile having a solid understanding of Photoshop. That way, if you encounter a difficult image, you'll have more tools available to you to work with it.

Storage Considerations

A comprehensive discussion of storage media is beyond the scope of this book. We'll cover only a few aspects here, which are especially pertinent for nature photographers.

Many nature photographers often do at least some of their photography away from home. We know one photographer who buys enough memory cards so that he can use a new one when needed rather than having to download and/or edit images while on the road. Although the cost of compact flash cards has come down considerably in the past few years, for most photographers, this is not a practical solution. Even if you can justify it monetarily, it's impractical because it means you will have all your editing to do when you get home, and that can be overwhelming. In addition, it eliminates one of the major advantages of digital shooting—the ability to review the shots you took during the day and to learn from what went right and what went wrong so you can adjust your shooting the next day accordingly. Being able to view your images, preferably reasonably large, allows you to fine-tune your shooting skills and experiment with new techniques while still on location. That way, you can return to a location if necessary or build upon a creative approach you tried.

When we're on a photographic trip, we prefer to take a laptop along and make certain that it has plenty of space on its hard drive. That way, we can download our images and view them at a reasonable size. (In addition, having the computer enables us to have email access while on the road.) Also, we take small external portable hard drives along. These drives are the size of a deck of cards. We back up all the images we store on our computer on this hard drive. That way if something happens to the computer, we still have a copy of all the files. If we're on a long trip that will involve a

lot of shooting and not much time for editing, we may bring along a second external portable hard drive for overflow images when the computer's hard drive becomes full. Ordinarily we recommend doing at least a first pass of editing each day to delete the images you are certain you don't want, but sometimes that's not possible. When we return home, we transfer the images to our main computer for further editing and archival storage.

Other people prefer to use a self-contained backup device such as the Hyper-Drive COLORSPACE UDMA (www.hypershops.com). Such all-in-one units contain a hard drive, card reader (often multiple card readers for different formats), and screen so that you can download your images without a computer, providing an extra measure of security in case your computer fails in the field. The COLORSPACE UDMA is particularly nice because it's available without a hard drive so that you can purchase a different, faster or larger hard drive and easily install it yourself.

After editing our images, we establish a "Best Of" folder for each shoot containing the images we want to keep. We store that folder on a RAID (Redundant Array of Independent Disks) system. A RAID system consists of two or more hard drives that function together. There are several different types of RAID devices, but we use RAID-5 (one of the most popular implementations). When you back up to a RAID-5 hard drive, the data is automatically copied to all the drives. If one hard drive develops an error, it uses the information on one of the other drives to correct it.

We currently use a particular type of RAID device called a Drobo from Data Robotics Drobo device (www.drobo.com). The advantage of the Drobo is that you fill it with hard drives as needed to give you as much storage as you need. It calculates how much space is available and acts accordingly. If you insert a single hard drive, it acts as a single hard drive. If you put in three or four drives, even if they have different capacities, it configures them automatically as a RAID-5 type of device. You can swap out one of the existing drives for a new one if a drive develops problems or if you simply want to increase the storage capacity. We find that RAID systems help guard against data loss if/when a hard drive fails, and Drobo makes the entire process of backup far easier than earlier RAID systems.

Some photographers opt to back their images up on individual external hard drives. The problem with this approach is that since all hard drives will eventually fail, it is quite possible that one day, without warning, you suddenly won't be able to access your images. If you opt to go this route, we strongly encourage you to copy your files to two different external devices. That way when one of them fails, the other will most likely still work, and you can re-create a duplicate backup. It makes sense to always have copies of your images in at least two places in case of a natural disaster, such as a fire, too.

Some photographers still prefer to use DVDs or CDs. If you have a lot of images, the volume of DVDs and/or CDs will become unwieldy unless you have a clear-cut system for storing and identifying the discs. In addition, it's imperative to use gold discs, which are archival and are reported to last 100 years or so. On the relatively rare occasions that we use DVDs for storage, we use the gold discs that are available from Delkin Devices. DVDs and CDs that are not gold may become unread-

able in as little as one year! If you have been using regular DVDs or CDs to archive your images, we urge you to copy them to a gold disc.

Another relatively new option is online storage services such as Apple's MobileMe iDisk (www.apple.com/mobileme, available for both PC and Mac operating systems) act essentially as an online hard drive. You pay a certain amount per year for a set amount of storage and can increase it according to your needs, although the maximum at the time of writing this book for MobileMe is 60GB. Companies, such as PhotoShelter (www.photoshelter.com) offer photo-specific online storage and have the capacity to store larger quantities of images. In addition, some allow you to showcase your work and may even serve as stock agencies. The advantage of online storage is that you maintain copies of your images in a location that's physically separate from your main storage. The potential disadvantages are cost, image-transfer time, and issues if the company providing the storage goes out of business. Nonetheless, it is a good option to consider in conjunction with your other storage.

Note: Whatever storage system you adopt, be consistent so that you protect your images and can locate them easily when you need them. You never know when "disaster" will strike. Having backup copies of your images readily available may save the day!