by Steve Berardi

First Edition

Copyright © 2017 by Steve Berardi

Published by Chaparro Media / chaparromedia.com

All images by Steve Berardi, with the following exceptions:

1. Camera clipart (page 5) - used under the CC0 1.0 Universal license
2. Aperture lens Mohylek (page 7) - used under the CC BY-SA 3.0 license
# Table of Contents

- Introduction 4
- 1 — How Does a Camera Work? 5
- 2 — Aperture 7
- 3 — Shutter Speed 13
- 4 — ISO 16
- 5 — Exposure 20
- 6 — Focus 32
- 7 — Depth of Field 42
- 8 — Sharpness 46
- 9 — Perspective 53
- 10 — Light 61
- 11 — Composition 71
- 12 — Lenses 79
- 13 — Memory Cards 85
- 14 — Accessories 89
- 15 — Camera Settings 93
- 16 — Respecting Nature 96
- 17 — Examples: Bringing It All Together 98
- 18 — Where to Go from Here 106
- About the Author 107
Introduction

The goal of this book is to teach you how to use the camera to capture all the wonderful moments you observe in nature. The concepts in this book apply to any kind of manual camera (any camera that allows you to change the aperture, shutter speed, and ISO), but many of the concepts apply to all types of cameras (including the simple camera on your smartphone).

There are three parts to nature photography: using the camera, vision/composition, and post-processing your images. This book will mostly focus on using the camera, but also covers some aspects of finding your vision and how to compose photos that fulfill your vision. In future books, I'll talk more about composition and post-processing your images.

Photography has a very technical side and a very artistic side, and it's usually the technical side where people struggle the most (at least in the beginning). It's important to understand many of those technical concepts, but this book will try to explain things without getting overly technical.

One of the things that makes it difficult to learn photography is that there's a lot of different topics to cover, and there's not always a logical order to learn them in. So if you get a little confused at some point while reading, then just keep reading—because as you keep learning, there's a good chance you'll start to see how things fit together.
1 — How Does a Camera Work?

The camera is basically a box that captures light. In film cameras, a sheet of light-sensitive plastic captures the light. And in digital cameras, a special sensor inside the camera captures the light. This book will talk specifically about digital cameras, but many of the concepts also apply to film cameras.

Okay, so a camera captures light. But, how does it do that? Well, first there needs to be some kind of light source. In nature photography, that light source is almost always the sun (sometimes you’ll also use a flash on your camera, but we won’t talk about advanced topics like flash in this book).

The light source shines some light on your subject, and your subject absorbs some of that light and reflects the rest. Then that reflected light enters your camera’s lens, a special door in your camera (called the “shutter”) opens up, and the camera’s sensor begins capturing the light. Finally, that door closes, and your photo is created!

Here’s a diagram that helps illustrate this process:

1. Light shines from a source onto the subject
2. Some of the light is reflected from the subject
3. Reflected light enters the camera’s lens
4. Camera’s shutter opens to let the light hit the digital sensor
5. Digital sensor starts collecting the light
6. Camera’s shutter closes again
7. The captured light is used to create an image on the memory card
8. You drive home and admire your images :)
Throughout this whole process of creating a photo, there are a bunch of variables that affect how your photo will look. Here are some that you can change on your camera:

- **Aperture** - how wide the lens is opened up
- **Shutter speed** - how long the shutter door is open
- **ISO** - how sensitive the sensor is

Each of these three settings affects the look of your photograph in a unique way, and they all control how much light your camera captures.

But, there are also a few other things that will affect the look of your photos:

- Focus
- Depth of field
- Sharpness
- Perspective
- Light
- Composition

The rest of this book will explore these concepts in detail. It’s important to understand how all these things work, because then you'll have complete creative control of your camera—allowing you to create all the images you can imagine.
2 — Aperture

Aperture refers to the size of the lens opening. Each lens has a set of blades inside that can expand or contract to control the size of this opening, as illustrated here:

![Aperture Illustration](image)

Changing the aperture will affect how much of your photo is in focus, and how much light passes through the lens.

**Aperture is Represented by F-numbers**

Aperture is represented by something called an “f-number” or “f-stop.” You’ll usually see it written as “f/2.8” or “f/4.” These numbers can range from f/1 all the way up to f/64. You may notice on your camera that the f-numbers seem to jump around a lot and don’t follow a nice “1, 2, 3” pattern. Don’t worry, I’ll explain this later in the section about the “f-number series.”

In the lenses pictured above, the one on the left is at f/2.8 and the one on the right is at f/16. So a smaller f-number actually means the size of the opening is larger. This is confusing to most photographers at first, but you’ll get used to thinking like this pretty quick.

**Aperture Controls Depth of Field**

Changing the aperture on your camera will affect the range of what’s in focus in your photo. This range of what’s in focus is called “depth of field.”

With a lot of depth of field, your photo will have a very deep range of focus (everything from the very close objects all the way to the very far objects will be in sharp focus). Here’s a photo that shows a lot of depth of field (notice how everything in this photo is in sharp focus):
But, with little depth of field, your photo will have a very shallow range of focus. So only the object you focus on will be in sharp focus, while everything else will get more blurred as it gets farther and farther from the object you focused on. Here’s a photo that shows very little depth of field (notice how just the flower is in focus, while everything else is blurred out):
As you increase the f-number, you also increase the depth of field of your photo. So a photo shot at f/16 will have much more depth of field than a photo shot at f/5.6.

Here are a couple examples that illustrate what happens as you increase the f-number:

At f/2.8, there’s not much depth of field, so most of the background is out of focus. But as the f-number is increased from f/2.8 to f/16, notice how a lot more detail is revealed in the background—at f/16, you can start to see that there are actually mountains in the background!
Aperture Controls How Much Light Passes Through the Lens

Aperture also controls how much light passes through the lens and onto the sensor. And, this is where it gets confusing, because small f-numbers actually let in more light than large f-numbers.

This is one of the most confusing concepts for beginning photographers, but don't worry, this is pretty much the only “gotcha” in photography.

For example, f/4 lets in more light than f/16.

One way to think about this is a trade off: with larger f-numbers you get more depth of field, but you let in less light.

To understand how much light f-numbers let in, it's helpful to understand how f-numbers are calculated.

Where Do F-numbers Come From?

The f-numbers are actually calculated as a ratio between the length of the lens (known as the focal length) and the diameter of the aperture:

$$f\text{-number} = \frac{\text{focal length}}{\text{aperture diameter}}$$

For example, if you're shooting with a 100mm lens (the focal length), and the aperture diameter is set to 25mm, the f-number will be 4 (100/25).

At first, you might think that doubling the aperture diameter would allow twice as much light to be transmitted. But it doesn't work that way, because doubling the aperture diameter would more than double the surface area of the aperture.

It's the surface area that needs to double when you want to transmit twice as much light, and to double the surface area of a circle, you have to multiply its diameter by the square root of 2 (which is about 1.414).

What this means is that if you take an aperture (such as f/4) and multiply it by 1.414, you'll get an aperture that lets in exactly half as much light (f/5.6):

$$4 \times 1.414 = 5.6$$

Since it's pretty hard to multiply a number by 1.414 in your head, it's helpful to memorize what's known as “the standard f-number series”:

f / 1 1.4 2 2.8 4 5.6 8 11 16 22 32

The f-numbers in this geometric series are known as “whole stops.” And the thing that makes them special is that each number in the series transmits exactly twice or one-half the amount of
light of the neighboring f-number. For example, f/5.6 transmits exactly twice as much light as f/8, and f/2 transmits twice as much light as f/2.8.

This will become more important to understand once we start talking about exposure, but for now just remember that aperture controls how much light passes through your lens.

**Every Lens Has a Minimum F-number**

If you look at the front of your lens, you'll notice there's an f-number on there (e.g. f/4 or f/3.5–5.6). This is the smallest f-number you can use with the lens.

When this number is a range (such as f/3.5–5.6), it means that the smallest f-number changes as you change the zoom of the lens. So at the minimum zoom you might be able to use f/3.5, but at the farthest zoom you might be limited to f/5.6.

**Big/Wide Apertures Refer to Small F-numbers**

In case you're not confused enough yet, here's another little curveball: as you start talking to other photographers, you might hear them refer to “big” or “wide” apertures. This actually refers to small f-numbers because, remember, aperture actually refers to the size of the lens opening, and the f-number is really just a ratio between the length of the lens and the size of the aperture.

So as you make the aperture “bigger” or “wider,” you're actually making the f-number smaller. Typically, anything between f/1 and f/5.6 is considered “wide.”

**How Do You Know What F-number to Use?**

Now that we have a good understanding of what aperture is, you might be wondering how you determine what f-number to use for a particular situation. Well, there are two things that you should think about:

1. **How much depth of field you need.** Since aperture affects what's in sharp focus, you need to decide what part of your image you want in focus and how much more of the scene you'd also like in focus.

   If you're trying to isolate a subject (such as a wildflower or a bird), typically you just want the subject in sharp focus and everything else out of focus, so you'd use a wide aperture (i.e. small f-number, something like f/5.6).

   If you're trying to photograph something like a landscape and want the entire scene in sharp focus, then you'd want to use a larger f-number to capture more depth of field. Something like f/11 or f/16 usually works well for landscapes.

2. **How much light you have to work with.** Since aperture also controls how much light enters your lens, it's useful for situations when you need to capture more light (such as dark scenes). We'll talk more about this in the exposure section though, since it relates to the other two important controls on your camera (shutter speed and ISO).
**Practice in Aperture Priority Mode**

Aperture is the most fundamental control of your camera, and one of the best ways to experiment with it and learn more about how it works is to set your camera to “aperture priority mode.”

With aperture priority mode, you set the aperture and the camera automatically sets everything else (shutter speed and ISO). So it lets you focus on learning just one thing at a time.

I recommend taking your camera out to a local park or even just your backyard to experiment with different apertures. Watch how changing the f-number affects the look of the photo.

**Things to Remember**

- Aperture is represented by f-numbers (e.g. f/2.8)
- Aperture controls depth of field (the range of what’s in focus)
- Depth of field increases as you increase the f-number (f/16 will capture more depth of field than f/2.8)
- Aperture also controls how much light passes through the lens
- As you increase the f-number, less light is allowed through the lens (f/8 transmits half as much light as f/5.6)
- A “wide aperture” refers to a large lens opening (between f/1 and f/5.6)
3 — Shutter Speed

Inside your camera, there’s a little door called the “shutter.” When you shoot a photo, this door will open, allowing the light to hit the camera’s sensor and capture an image. The shutter speed controls how long this door stays open.

**Shutter Speed is Represented by Fractions of Seconds**

On your camera, shutter speed is represented in terms of seconds. So if your camera says the shutter speed is “1/30” that means 1/30th of a second. Or if your camera says “2” that means 2 seconds.

If the sight of fractions scares you, don’t worry, you won’t have to do much math with fractions. Just remember that 1/1000th of a second is actually two times faster than 1/500th of a second.

**Shutter Speed Controls How Much Movement is Captured**

Changing the shutter speed will affect how much movement is captured in your photos. With a really fast shutter speed, you can freeze the action of your subject, like in this photo:

This photo of a bald eagle in flight was shot with a shutter speed of 1/2000th of a second, which helped freeze the motion of its wings.

With a really slow shutter speed, any movement is blurred, like in this photo of a fast-moving stream:
This photo was shot with a shutter speed of 4 seconds. With such a long shutter speed and the movement of the water, the result is smooth-looking water. Notice how everything else is sharp though (like the big rock in the center of the image)—that's because nothing else was moving. Only the water was moving, so only the water is blurred.

Here are a couple photos that show how much shutter speed can affect the look of your images:

The shutter speed in the first photo above is almost twenty times faster than the shutter speed in the second photo. As a result, very little movement is shown in the first photo. The movement that's captured in the second image is from the wind—even on a very calm day, plants are almost constantly swaying in the air. So, shutter speed is a very important thing to consider when you're photographing anything that's moving (even if it's moving just a little bit).
Shutter Speed Controls How Much Light Is Collected

Just like aperture, shutter speed also controls how much light is collected by your camera. The longer your shutter speed, the more light your camera will capture.

Shutter speed has a direct relation to how much light is collected, so if you make your shutter speed twice as long, then your camera will capture twice as much light.

For example, if you change your shutter speed from 1/160 second to 1/80 second, then your camera will be collecting twice as much light.

We'll talk more about this and how it relates to aperture and ISO later in the chapter on exposure.

Things to Remember

- Shutter speed controls how long the “shutter” is open
- Shutter speeds are represented by fractions of seconds (e.g. 1/10 sec or 1 sec)
- Shutter speed affects how much movement is captured in your image (fast shutter speeds will show less movement than slow shutter speeds)
- Shutter speed controls how much light is collected by the camera (making your shutter speed twice as long will make the camera capture twice as much light)
4 — ISO

Every digital camera has a sensor inside that’s used to capture the light. The ISO speed controls the sensitivity of this sensor. It’s basically like an amplifier for capturing more light when you need to.

ISO Is Represented by a Number, in Multiples of 100

On most cameras, the ISO starts at ISO 100 or 200 and then keeps doubling, so there’s an ISO 200, 400, 800, 1600, etc. Many cameras also have ISOs in between the multiples of 100—for example, 250, 320, 500, 640. I recommend avoiding these in-between numbers because on many cameras, they’re just digital interpolations of the standard ISOs (that basically means they’re not really “true” ISOs).

ISO Affects the Amount of Noise in Your Photos

Changing the ISO will affect the amount of noise in your photos. Noise is that ugly discoloration that makes your photos look “grainy”:

As you increase the ISO number, you also increase the amount of noise in your photos. So a photo shot at ISO 400 will have more noise than a photo shot at ISO 100.

Generally, with any camera made after 2009, there’s not much visible noise from ISO 100 up to ISO 400. With newer cameras, ISO 800 also has very little noise.

Here are a few examples that show how noise is increased as you increase the ISO:
As you can see, there’s hardly any noise visible at ISO 200, and it’s just barely noticeable at ISO 800. Once you get to 3200 though, it’s obvious. And even more so at ISO 12800.

Another thing to point out is that these image samples are from a very dark section of the image. In general, noise is a much bigger problem in the darker areas. So if your image will mostly be bright, then you don’t have to worry about noise as much when you increase ISO.

**ISO Controls the Sensitivity of Your Camera’s Sensor**

As you increase ISO, you also increase the sensitivity of your camera’s sensor, which allows it to capture more light.

The ISO basically acts like an “amplifier” for your camera’s sensor. It amplifies the amount of light that your camera collects.
The ISO number has a direct relationship to how sensitive your camera’s sensor is, so if you increase the ISO from 100 to 200, then you just doubled the sensitivity of your camera (which means it’ll collect twice as much light). And if you go from ISO 100 to ISO 400, then you just doubled it twice (meaning it’ll capture four times as much light).

This is extremely useful in situations where you need a faster shutter speed or smaller f-number. To compensate for the small amount of light that a fast shutter or small f-number allows through the camera, you can increase the ISO.

Don’t worry if this is confusing right now, since we’ll explore this in much more detail when we talk about exposure in the next section.

**Don't Be Afraid of the Higher ISOs**

After seeing how much noise those higher ISOs (1600 or higher) add to your photos, you might be wondering why you’d ever use an ISO that high. Well, those higher ISOs are extremely useful for times when there’s very little light and you can’t use too long of a shutter speed.

The perfect example is photographing the Milky Way. Since many stars are very faint, you need to capture a lot of light to make them visible in your photos. The problem is that if you use a shutter speed of more than thirty seconds, you start to get star trails. So one way around this is to use a high ISO (3200 or higher) to make your sensor more sensitive. Don’t worry if this doesn’t make perfect sense yet, we’ll explore it in more detail in the next section on exposure.

In order to capture the stars in the photo above, I had to use a high ISO (3200) to get a shorter shutter speed (33 seconds).
Things to Remember

- ISO controls the sensitivity of the camera’s sensor
- ISO is represented by numbers in multiples of 100 (100, 200, 400, etc)
- As you increase ISO, you make the sensor more sensitive, but you’ll also get more noise in your photos
- Don’t be afraid to use the higher ISOs when you truly need them (for example, when photographing the Milky Way)
5 — Exposure

Exposure refers to the total amount of light captured by your camera. To control the amount of light captured, you adjust the aperture, shutter speed, and ISO.

Exposure is all about finding the right balance between these three settings (aperture, shutter speed, and ISO) to capture the right amount of light and get the photo you’re looking for.

To get a good-quality photo with accurate color, it’s extremely important to capture the right amount of light.

If you capture too little, then you’ll end up with a really dark and underexposed photo that lacks detail. If you try to fix a dark photo in post-processing, you’ll often get a lot of noise in the image and color textures won’t be as smooth.

If you capture too much light, then you’ll have overexposed areas that are pure white. Once a part of your image becomes overexposed, you lose detail, so you usually want to avoid overexposing any part of your photo.

So how do you find the right amount of light to capture?

Well, luckily, with digital photography there’s an extremely helpful tool for finding that perfect exposure: the histogram.

Use the Histogram to Find the Perfect Exposure

The histogram is a wonderful tool for finding the best exposure. If the word “histogram” brings back bad memories of boring lectures in math class, don’t worry—the histogram is pretty simple. It basically just shows the distribution of light and dark pixels in your image.

Here’s an example, with each axis labeled:

The left side of the graph shows how many dark pixels you have in your image, while the right side of the graph shows how many light pixels you have in your image. So in this example, the image mostly has dark to midtone pixels.
At first you may think that every image should have a balanced (i.e. bell curve) histogram, but this doesn't always happen. It really depends on your image. For example, the histogram of a snow-covered landscape will mostly consist of bright pixels, so it'll carry most of its weight on the right side of the histogram. But a photograph of a black vulture will mostly consist of dark pixels.

Let's look at a real example. Here's a photo of a desert five-spot flower and its corresponding histogram:

![Desert five-spot flower](image)

At first you might be confused: this is a flower, and it's bright, so shouldn't all the pixels be on the bright (right) side? Well, although this is a photo of a wildflower, the flower actually takes up a very small part of the frame. Most of the background is actually quite dark, which takes up the majority of the frame.

This is just the regular histogram though. There's actually another version that'll tell you a lot more about the exposure of your photos: the RGB histogram.

If you understand the regular histogram, then the RGB histogram is simple. It shows the histogram of each individual color channel (red, green, and blue).

The bad thing about the regular histogram is that it lumps all these color channels together, making it hard for you to see if you're underexposing or overexposing a specific color channel.
And on some cameras, the regular histogram only shows you the green channel, leaving you completely blind to the red and blue channels (which happen to be some pretty common colors in nature!).

So the RGB histogram is similar to the regular histogram, but now you have a separate histogram for each color channel.

The goal with the RGB histogram is simple: you don’t want to underexpose or overexpose any of the color channels, so look at each channel’s histogram to ensure the graph isn’t bunching up to one side and overflowing off the graph. If you’re overexposing your image, then the histogram will show a line on the far right that extends all the way to the top of the histogram:

![overexposure]

As an example, below is the RGB histogram for the same photo I showed earlier of the desert five-spot:

![RGB histograms]

Notice how the green channel doesn’t spread all the way to the right? At first, you might think this means the image is underexposed, but remember: this is only the histogram of the green channel.

With the RGB histogram, your goal is not necessarily to get a balanced histogram in each channel, but to ensure you’re not losing details in any one of the color channels by underexposing or overexposing.

Your goal is to keep increasing exposure until the histogram is as far to the right as possible in at least one of the color channels. And you do that by changing the aperture, shutter speed, and/or ISO.

So although the green channel doesn’t have many highlights in this image, notice how the blue channel does: its histogram is spread out and nearly touches the right side. The important highlights in this image are in the blue channel, so that’s what I exposed for.

Many times you will have just one of the color channels spreading all the way to the right while the others will be to the left or in the middle. The channel you should focus on is the one that’s farthest to the right. In this case, it was the blue channel.
The reason you want to expose to the right is very technical, but the simple explanation is that it helps maximize the signal-to-noise ratio of your camera's sensor (this means you'll have less noise), and it ensures the camera gets an accurate measurement of the light.

How to Find the Perfect Exposure

Before we walk through an example of how to find the perfect exposure, it's important to have some settings enabled on your camera:

- **Enable “blinkies.”** Your camera should have a feature that'll make overexposed areas of your photo “blink” black and white when you view them on the preview screen. This might be enabled by default, but if it's not, then make sure you enable it, because it will really help you determine if and where you're overexposing the image.

- **Set saturation/contrast to zero.** On most cameras, there's something known as picture “styles” or “controls” that have various adjustments like sharpness, saturation, and contrast. When you're relying heavily on the histogram, it's important to set all these to zero so it doesn't affect the histogram. Don’t worry, if you’re shooting in RAW format, you can safely change these settings later in post-processing without affecting image quality.

- **Set metering mode to “Evaluative.”** Your camera should have a bunch of different metering modes. The metering mode determines how the camera will try to guess the correct exposure. Since we'll be using the histogram to find the perfect exposure, it really doesn't matter what metering mode you use. However, evaluative metering will usually create a good place to start.

- **Set your camera to aperture priority or manual mode.** I recommend using the full manual mode on your camera because then you'll have full control and don't have to worry about the camera adjusting shutter speed. But aperture priority mode is an acceptable option too, in case you're still a little nervous about using the manual mode (I promise it's easy though!).

Okay, now that you understand the histogram and your camera is all set up, let's go through a step-by-step example of how to find the perfect exposure. I'll be walking you through how I found the exposure for this photo of a chocolate lily:
1. **Find your composition and determine your goal for the photo.** First, you need to figure out your composition and determine how much depth of field you want. This doesn't have to be exact at first, you just need somewhere to start. In this example, I wanted an out-of-focus background with little depth of field, so I set my aperture to f/6.3.

2. **Meter the scene and take a test shot.** Once you have your aperture set, then it’s time to figure out shutter speed. If you’re in aperture priority mode, the camera will automatically determine this for you when you press the shutter button. If you’re in manual mode, then you can find what your camera “thinks” is the right shutter speed by pressing the shutter button halfway and then looking at the exposure compensation scale:

In the example above, the camera is saying that the current shutter speed is too slow. You want to keep making the shutter speed longer (or shorter) until that little dial (circled in red) is in the center of that scale.
Going back to the chocolate lily example, my camera recommended a shutter speed of 1/320 seconds. So at this point I took a test shot:

![Image of chocolate lily](image)

The camera usually recommends a pretty good exposure, but almost always underexposes (makes the image too dark), and that’s exactly what it did in this photo. Notice how the green histogram still has some room on the right there? This indicates underexposure.

The other two color channels (red and blue) are also pretty far from the right in this example, but because green is already the closest to the right, you should just worry about the green channel here when finding the proper exposure.

3. **If the histogram shows overexposure, decrease exposure; otherwise, increase it.**

Since in this case the camera underexposed a little, I decided to use a bit longer shutter speed of 1/250 seconds. Keep in mind I had two other options to increase exposure: either increasing ISO or using a wider aperture. I chose to adjust the shutter speed because I was already using ISO 400 and didn’t want the less depth of field that comes with a wider aperture.

If you’re using aperture priority mode, then you can adjust the shutter speed by using the “exposure compensation” on your camera. In manual mode, you have complete control of the shutter, so just rotate the dial in the right direction.

Here’s the resulting image and histogram from the new exposure:
Notice how all the channels moved farther to the right? This is because I made the shutter speed longer (in other words, I increased the exposure). Since the green channel is now as far to the right as possible (without actually going off the graph), I knew this was the best exposure.

**Understanding Dynamic Range**

Dynamic range is the range of brightness that something can capture. The human eye has a very large dynamic range, so we can look at a scene that has very bright areas (i.e. the sky) and very dark areas and still see detail in both of those areas. The camera has a very hard time capturing a scene like that because it has a much smaller dynamic range. Like many things in photography, this is easiest to understand by looking at an example, so take a look at this photo:
This image was actually made from two photos, since the camera couldn't capture the full dynamic range of the scene. When you have a typical sunset scene like this, where the sky is very bright and the landscape is all in shadow, the camera won't be able to capture the scene like your eyes see it. If you photograph this scene, wanting to keep the colors and detail in the sky, then you'll get a photo like this:

![Sunset Image]

The sky looks great here, but there's absolutely no detail in the landscape! If you increased the exposure until there was enough detail in the landscape, then your photo would end up looking like this:

![Landscape Image]

But now there's no detail in the sky! The problem here is the large range of brightness—your camera can't capture it all in one photo. Luckily, with digital photography, there are a few good options for capturing the entire dynamic range of a scene like this:
1. **Take two photos and merge them in post-processing.** If you want to get the best quality image possible, this is your best option. It works great for landscape images, and it’s the method I used to photograph the desert scene above. You’ll need a stable tripod for this method though, since it’s critical for both images to line up properly. There are various ways to merge the photos in post-processing (layer masks, HDR, image fusion, etc), and I’ll discuss them in a future book on post-processing.

2. **Take one photo somewhere in the middle between the bright/dark spots.** If you’re not using a tripod or you just want to keep things simple, you can photograph the scene somewhere in the middle (in terms of brightness). In this case, your sky will be a little too bright (and you’ll lose a little detail as a result), and your landscape will be a little too dark, but with some selective post-processing you’ll be able to correct the brightness of each area.

3. **Modify the light with diffusers and/or shaders.** This is a great option for close-ups and we’ll talk more about it in the chapter on light.

**Understanding Stops of Light**

Once you find the perfect exposure at a given combination of aperture, shutter speed, and ISO, it’s helpful to be able to quickly calculate the new exposure if you change one of those settings.

For example, let’s say you initially set up your camera to photograph a butterfly and have an aperture of f/5.6, shutter speed of 1/125, and ISO of 100. Then you take a few shots and notice they’re all blurry because there was some wind blowing. So in order to help freeze the motion, you want a faster shutter speed. But how would you do that without messing up the exposure? If all you ended up doing was making the shutter speed faster (to, let’s say, 1/500 sec), but you didn’t change the aperture or ISO to compensate, then you’d have a very dark photo.

Okay, so how do you know how to compensate for changes in aperture, shutter speed, and ISO? Well, this is where “stops of light” come into play.

A “stop of light” is the idea of reducing the amount of light in half or doubling it. So if you increase by a stop of light, then you’re saying you’re doubling the amount of light. If you decrease by a stop of light, then you’re saying you’re taking in half as much light.

As I mentioned before (very briefly), each of those three settings controls the amount of light that your camera collects, so there’s a way of describing them in terms of “stops of light.” Here’s how:

- **Aperture.** Remember the standard f-number series? If not, here it is again:

  \[
  f \div 1 \quad 1.4 \quad 2 \quad 2.8 \quad 4 \quad 5.6 \quad 8 \quad 11 \quad 16 \quad 22 \quad 32
  \]

  Knowing this series is important because the difference between each number in the series is exactly one stop of light. So for example, going from f/4 to f/5.6 would make the lens transmit exactly one stop **less** of light. On the other hand, going from f/8 to f/5.6
would make the lens transmit one stop more of light.

- **Shutter speed.** Don’t worry, stops of light are much easier to understand for shutter speed than for aperture! With shutter speed, you add a stop of light by making the shutter speed twice as long. To reduce shutter speed by a stop, you divide it in half. So for example, if your shutter speed is 1/2 sec and you want to add a stop of light, then you’d increase the shutter speed to 1 sec. On the other hand, let’s say your shutter speed was 1/10 and you wanted to decrease it by one stop, then you’d change the shutter speed to 1/20.

- **ISO.** With ISO, you add a stop of light by doubling the ISO value, and you reduce by one stop by dividing the ISO value in half. For example, if your ISO is 400 and you wanted to add another stop of light, you’d increase the ISO to 800. But if your ISO is 200 and you wanted to reduce it by a stop of light, you’d switch to ISO 100.

**Examples**

Hopefully you’re not too confused yet! I know, this is more math than you were probably hoping for, but I promise once you get the hang of it, it will become super easy to make these calculations. Ok, let’s go over some examples:

1. **Mexican Pink Wildflower**

   ![Mexican Pink Wildflower](image)

   Let’s say you’re walking down a trail, and you see this beautiful red flower that you want to photograph. You decide you just want one flower in the scene, isolated against an out-of-focus background, so you set your aperture to f/5.6, ISO to 400, and use the histogram to determine a shutter speed of 1/25. You take a few shots, but then after reviewing them, you realize there’s more depth of field than you’d like. So you want to try the shot at f/4 instead of f/5.6. With this change, you’re increasing the amount of light by one.
stop, so you need to make a change to the ISO or shutter speed to compensate for this new extra light coming into the camera. You could either decrease the shutter speed to 1/50 or decrease the ISO to 200. Since there's not much noise at ISO 400, and since faster shutter speeds are usually good to help battle the wind, it probably makes more sense to change the shutter speed here. So the resulting settings would be: f/4, 1/50 sec, and ISO 400.

2. Anna’s Hummingbird

Let's say you see a hummingbird perched on a branch, and he's really close. So you initially set the aperture to f/8, your ISO at 400, and using the histogram, you arrive at a shutter speed of 1/640. It's partly cloudy, so there's a medium amount of brightness. You're handholding your camera, and after taking a few shots you realize they're a little blurry because of camera movement. You decide you want a faster shutter speed to help battle the effect of camera movement, so you decrease the shutter speed by one stop to 1/1250. Now you have to change the aperture or ISO to compensate for this loss of light. You can either increase the ISO to 800 or change the f-number to f/5.6. Since there's not much noise at ISO 800, that's probably the best decision here.

One of the biggest struggles in nature photography is finding the right balance between aperture, shutter speed, and ISO while also getting a good exposure. Sometimes you won't find that perfect balance, because nature is out of our control—sometimes that butterfly will land on the wrong flower, or a bird won't stand still for long enough. That's why patience is really important in nature photography.
Things to Remember

- Exposure refers to the total amount of light captured by your camera
- To control exposure, you adjust the aperture, shutter speed, and ISO
- Use the histogram to find the best exposure by ensuring the graph is far to the right in at least one color channel
- Each of the big three camera settings (aperture, shutter speed, and ISO) can be expressed as “stops of light”
6 — Focus

Another thing you can control in your images is where you focus the lens. This will determine the sharpest part of your image. For example, I focused on the eyes of the bird in this photo:

![Bird on a post](image)

Choosing a good focus point is an important decision because the viewers of your photo will usually look at the sharpest part first. So focus is a great way to draw attention to your subject.

Focusing Modes on Your Camera

Your camera should have a bunch of different options for focusing: manual, full auto, point-based auto, and continuous. Here’s a description of these different options and when they’re useful:

- **Manual.** This mode puts you in complete control of where the lens will focus. There should be a switch on your lens that lets you switch between manual and autofocus. When your lens is on manual focus, you have to turn a ring on your lens to focus it at a particular point. Since autofocus works so well on most lenses these days, manual focus is usually only useful for extreme close-ups (where autofocus doesn’t always work as well).

- **Full auto.** With full autofocus, your camera will make all the decisions about where to focus for each photograph. This is usually a very dangerous mode because your camera won’t always automatically focus where you want it to. It’s a perfectly okay mode to work with in the beginning, but I’d recommend quickly making the jump to point-based autofocus.
• **Point-based autofocus.** With point-based autofocus, you choose a specific point to focus on and then your camera will always focus at that point. Most manual cameras these days have a set of “autofocus points” that you can choose from and that cover most of the frame (check your manual to learn how to change this autofocus point). This focusing mode will be the one you use the most, because it gives you the ease of autofocus but also focuses the lens on the exact spot you want.

• **Continuous autofocus.** With continuous autofocus, your lens will track a moving subject in your frame, and continually refocus on it as that subject moves farther (or closer) from your camera. This mode is extremely useful for photographing moving subjects like birds in flight.

**How to Get Better Control of Autofocus**

On most cameras, you activate autofocus when you press the shutter button halfway. The problem with this (especially in nature photography) is that you don’t always want to activate autofocus every time you press that button to snap a photo.

Instead, it’s a good idea to set up your camera so autofocus only activates exactly when you want it to. This is possible on most cameras, and it’s called “back-button autofocusing”—this special feature allows you to use a button on the back of your camera to initiate autofocus.

You can do the same thing without this back-button autofocusing by switching to manual focus after the camera focuses properly, but using the back button saves time, and this way you don’t have to constantly switch back and forth between manual and auto focus (which can inadvertently move the camera sometimes).

This back-button focusing is also extremely helpful for photographing birds in flight or other wildlife. Just switch on continuous focusing mode, set the autofocus point to the center spot, and hold down that back button. Now you don’t have to worry about accidentally hitting the shutter button while you’re tracking the bird in your viewfinder.

**You Only Get One Sharp Plane of Focus**

The most important thing to understand about focus is that you only get one geometrical plane of sharp focus.

Whenever you focus your lens on something, what you’re really doing is telling your lens to focus on everything that’s a specific distance from your camera’s sensor. You’re focusing on a geometrical plane that’s parallel to your camera’s sensor. Everything in that plane will be completely tack sharp in your photograph, and as objects get farther from that plane, they’ll get more and more out of focus.

So to maximize the sharpness of your subjects, you should first determine the most important plane of the subject and then position your camera so its sensor is parallel to that plane.
This concept can be pretty confusing in words, so let’s take a look at an example. Consider the two setups below for photographing a box of pasta:

In Setup A, I carefully positioned my camera so its sensor was parallel to the front of the pasta box. But in Setup B, my camera was pointing down towards the pasta box at an angle.

In both setups, I used the exact same equipment and camera settings: f/5.6, 1/5 sec, ISO 400, and a 100mm macro lens on a Canon 5D Mark II. I also focused the lens on the exact same spot for both setups: on the “P” in “Plus,” which appears on the front of the pasta box.

So let’s see how the photos compare from the different angles:

From this view, both shots look equally sharp. So let’s zoom in more and see if this stays true:
The lens was focused on the “P” in “Plus” for both shots, so both photos are still sharp here. But watch what happens below as we move farther down in the image:

Since the camera’s sensor in Setup A was parallel to the front of the box, the text is still sharp.

But in Setup B, the text is starting to get out of focus because the sensor was pointed at an angle towards the front of the box (so this letter “R” is getting farther from that sharp plane of focus).

Let’s move down just a little bit more to see how quickly things get out of focus for the second setup:
Again, Setup A is still sharp because the bottom of the box is still parallel to the camera’s sensor. But in Setup B, the bottom of the box is almost unreadable.

Here’s a look at the two setups again, along with each of their planes of focus highlighted in the image with a blue line:

![Setup A and B with planes of focus highlighted](image-url)

In Setup A, the entire front side of the box is in the plane of sharp focus, while in Setup B, only the top part of the box is in that sharp plane of focus.

Of course, I could have used a smaller aperture to get more in focus for Setup B, but then there’d also be more depth of field, and you might not necessarily want that. Not only that, but with a smaller aperture you’d also need a longer shutter speed and/or higher ISO to get the same exposure.

As an example of how this concept applies to a real life nature photo, let’s take a look at this image of a tidy tip wildflower:

![Tidy Tip Wildflower](image-url)
The flower in this photo is extremely sharp because I carefully positioned my camera parallel to the top surface of the flower. Since the flower was also flat and all those petals were on the same geometrical plane, I was able to maximize sharpness in this photograph.

As photographers, sometimes we get a little obsessed with sharpness, so it’s important to remember that composition still comes first. You don’t always have to follow this idea of making your camera parallel to the most important plane of your subject.

For example, one day I was out photographing some desert wildflowers and saw this beautiful yellow sunflower in front of some purple sand verbena:

![Sunflower](image)

The sunflower in this photograph could have been a lot sharper since my camera was not positioned parallel to the stem of the flower. I was actually looking down on the flower (like in Setup B as discussed previously). But I had to look down because that was the only way I could get the purple sand verbena in the background. If instead I had my camera positioned parallel to the stem, I would’ve had brown rocks and a little bit of sky in the background—not nearly as good a background as bright purple!

So keep this idea in mind when you’re positioning your camera for a shot, but don’t look at it as a “set in stone” kind of rule (there are rarely any of these kinds of rules in photography).

**Where Should You Focus?**

Okay, so now that you know about how focusing works, you might be wondering where you should actually focus your lens. What part of your subject should be the sharpest?
Well, sometimes this depends on what you want to draw attention to in your photo (remember that the viewer will usually look at the sharpest part of the image first). But there are also a few general guidelines about where to focus for specific subjects:

- **Wildlife.** When photographing wildlife, it’s best to focus on their eyes. This is where the viewer will always want to look first in a photo of wildlife, so it’s best if those eyes are in sharp focus.

- **Close-ups.** This one is tough because it can vary. If you’re photographing something like insects or small lizards, then you want to follow the wildlife rule of focusing on the eyes. Other than that, it’s about where you want to guide the viewer while also maintaining your desired depth of field. For example, I had a tough time deciding where to focus on this close-up of a silver puff flower:

![Silver puff flower](image)

I couldn’t decide if I should focus on the outer edges of the flower or the inner part. Ultimately, I decided the center because that’s what initially drew me to the flower. I loved how those smooth/fragile dewdrops contrasted with the sharp lines of the flower.

Many times (like in the image above), there’s no right or wrong answer of where to focus. It really depends on your vision for the image and what you’re trying to emphasize. So when you’re having trouble with deciding where to focus, ask yourself: what is the main point of this image?

- **Landscapes.** When photographing landscapes, you usually want to have the entire landscape in sharp focus. So to help evenly distribute the focus, it’s best to focus at something that’s about a third of the way into the scene (in terms of distance). The reason you generally want to focus closer (rather than halfway into the image) is because the human eye will perceive farther objects as more sharp if near objects are sharp. It’s more critical for those close objects to be sharp.
In the photo above, I focused where the green arrow is pointing. This helped ensure that all the closest objects in the scene were in sharp focus, which makes farther objects appear sharper than they really are.

**How to Make Autofocus Work Better**

If you’ve ever had trouble getting your camera to autofocus on a specific spot in your image, it's helpful to know a little about how autofocus works. Basically, autofocus works by detecting contrast and then adjusting focus until it maximizes the sharpness of that contrast.

This means that autofocus will have a really hard time if you set the focus point somewhere that lacks contrast. For example, going back to the landscape image above, here's some spots where autofocus will have trouble:
Autofocus will have a lot of trouble working on these spots because they’re in the middle of a big dark section of the image. There’s no contrast at these spots.

On the other hand, here are some spots where autofocus would work well:

Autofocus would work well on all the spots above because these spots all have a lot of contrast nearby. All those bushes are bright while the ground is dark, and the top of that ridge in the background would be easy for autofocus because it has a strong contrasting edge with the sky.
Things to Remember

• In general, you’ll want to use point-based autofocus
• Most cameras have a continuous autofocus mode that’s useful for photographing fast-moving subjects like birds in flight
• Use “back-button autofocusing” to get better control of autofocus
• Every photograph has one geometrical plane of complete sharpness; things get more out of focus as they move farther from this plane
• With wildlife, focus on their eyes
• With close-ups, focus on the most important part of the image
• With landscapes, generally focus a third into the frame
• Autofocus works best on contrasting edges in an image
7 — Depth of Field

We first talked about depth of field back in the chapter about aperture. Remember that you can control the amount of depth of field by changing the aperture of your lens. With a small f-number, you’ll have little depth of field, and with a large f-number, you’ll have a lot of depth of field.

In addition to aperture, there are two more things that affect depth of field:

1. Distance from your camera to where you’re focusing
2. Focal length of your lens

How Distance Affects Depth of Field

As your camera gets farther away from where you’re focusing, depth of field is increased. So if you’re really far from your focus point, then most of your scene will be in focus.

On the other hand, as your camera gets closer to where you’re focusing, depth of field is decreased. So if you’re really close to your subject, you’ll have very little depth of field (much less of the scene will be in focus).

Understanding this concept is extremely useful for close-up photography, because you’ll often want that nice out-of-focus background when doing close-ups. As you get closer to your subject, the background will get more and more out of focus (which helps isolate your subject and make it stand out).

Let’s look at an example:
If you look at the two images above, you should notice that there's less depth of field in the photo on the right. All I did to reduce the depth of field here and get a more out-of-focus background was move a little closer to the plant. The aperture and everything else on my camera stayed exactly the same.

Another thing to keep in mind about distance and depth of field is that as stuff gets farther and farther away from your focus point, it'll be more and more out of focus. This is important to remember when you want to photograph your subject in front of a blurred out background, like in this photo:

![Image of blurred background](image)

There are three reasons why the background is so out of focus in this photo above: I used a very small f-number (f/5.6), my camera was fairly close to those leaves, and the background is very far away (about 25 feet).

So if you have trouble getting that nice out-of-focus background, try getting closer to your subject and/or photograph it from an angle where the background is much farther away.

### How Focal Length Affects Depth of Field

As you increase focal length, you'll get less depth of field. For example, if you switch from a 100mm lens to a 200mm lens, you'll have much less depth of field. This works the other way too, so if you use a shorter lens, then you'll have more depth of field.

This is also important in close-up photography, because it means as you use a longer lens, you'll also get a more out-of-focus background.

Let's look at an example using the same plant from the previous section:
The photo on the right has much less depth of field, so the background is more out of focus. All I did here to reduce depth of field was zoom in with my lens (a Canon 70-200mm) from 100mm to 200mm. The aperture and everything else on my camera (including its position) stayed exactly the same.

**How to Get That Nice Out-of-Focus Background**

One of the most common goals in nature photography is to photograph your subject in front of a nice out-of-focus background, like in this photograph:
The subject is sharp while the background is blurred out. This really helps draw attention to your subject.

So let’s bring all these concepts about depth of field together and figure out how to get this nicely out-of-focus background:

- Use a small f-number (wide aperture)
- Get as close to your subject as possible
- Photograph your subject when the background is far away
- Use a long lens (at least 200mm)

You may not always be able to follow all those rules, but keep them in mind when you’re trying to get the right depth of field in your images.

**Aperture Has the Smallest Effect on Depth of Field**

In photography, it’s commonly believed that aperture is the only thing that affects depth of field, but in reality, compared to distance and focal length, aperture has a very small effect on depth of field.

Aperture has a direct relationship to depth of field, so if you double the aperture, you also double the depth of field. That means if you go from f/4 to f/8, you’ll have twice as much depth of field (notice that’s two f-stops of difference). In comparison, if you double the distance between your camera and focus point or double the focal length, then you’d change the depth of field by a factor of four instead of two.

The takeaway here is that if you want more or less depth of field in an image, then you might want to think about changing the camera-to-subject distance or your lens before changing the aperture.

**Things to Remember**

- Depth of field is controlled by three things: aperture, distance from camera to focus point, and focal length of your lens
- Depth of field is decreased as you move the camera closer to your focus point
- Depth of field is decreased as you use a longer lens
- Aperture has the smallest effect on depth of field
8 — Sharpness

One of the goals of a good photo is to ensure that it's sharp enough. This is especially important for close-ups of things like insects because the extreme sharpness will help emphasize the beautiful detail in these extraordinary creatures.

There are two things that will affect the sharpness of your images: movement of your subject and movement of your camera.

If both your camera and your subject are completely still when you shoot your photo, you'll get a perfectly sharp image. Unfortunately, you're rarely this lucky in nature photography. So let's explore what we can do in these situations.

**Movement of Your Subject**

One of the most difficult things about photographing nature is that there's very little you can control. Your subject will often move when you don't want it to.

This is most commonly a problem with photographing wildlife, since they're almost always on the move. But it also becomes an issue when photographing things like plants. Even on an extremely calm day, plants will constantly sway in the air.

Here are a few things you can do to deal with the movement of your subject:

1. **Use a faster shutter speed.** The simplest thing you can do is use a faster shutter speed, which helps freeze the action of your subject. How fast of a shutter you'll need depends on how fast your subject is moving, so experiment with a few different speeds.

2. **Wait until your subject stops moving.** You can also just wait until your subject stops moving. This is sometimes an option when you're photographing something like wildflowers (which seem to constantly sway in the air). It may take awhile before the wind dies down or that insect sits perfectly still for a second, but patience is one of the most important skills in nature photography!

3. **Track your subject and use continuous focusing.** When your subject is constantly moving (such as a bird in flight), the best way to get a sharp photo is to track the subject with your camera. Try to keep the subject in the exact same area of the frame as you track it, and turn on continuous focusing so your camera will automatically adjust the focus as you track your subject.

4. **Emphasize the movement.** Another thing you can do to deal with the movement of your subject is to simply emphasize that movement and capture the motion. Remember from the chapter on shutter speed how you can control the amount of movement you capture? Well, sometimes it's nice to get a little blur in your photos that helps show that your subject was moving. This works best when you really emphasize the movement though, so make sure you use a long enough shutter speed to get a good amount of blur.
Hummingbirds move really fast, so emphasizing that movement usually works well, like in the image above. I purposely wanted the wings a little blurry to show movement.

**Movement of Your Camera**

Another thing that'll result in unsharp photos is movement of your camera. By far the best way to prevent your camera from moving is to use a good tripod. But sometimes you can't use a tripod, so we'll explore a few ways to keep your camera still: with a tripod, improvising a tripod, and handholding your camera.

**Using a tripod.** Compared to everything else in photography, the tripod seems like the simplest thing to use: just extend the legs, put the camera on top, and you're ready to go! Well, unfortunately it's not that simple. As Ansel Adams wrote in his wonderful book *The Camera*:

> “Many photographers casually set up the tripod and use the various tilts and adjustments in a haphazard way. It is preferable, however, to be more methodical in setting up the tripod, if time and situation permit, to provide precise positioning of the camera and the greatest possible stability.”

Here's how to use your tripod properly:

1. **Find your composition first.** Since it takes a good amount of time to setup a tripod, it's a good idea to find your composition first and then worry about the tripod. So walk around and explore your subject from different angles. It may help to look through your viewfinder as you do this to help you see exactly what the composition will look like as a photo.
2. **Point one of the tripod legs towards your subject.** Pointing one of the tripod legs towards your subject will give you room to stand between the other two legs (helping to prevent you from tripping over the tripod), and it can help stabilize the camera some more when it’s pointed towards the ground.

3. **Keep the center post vertical and perpendicular to the ground.** To ensure the weight of your camera is evenly distributed to all three legs, make sure the center post is vertical and perpendicular to the ground. Using one of those bubble levels that attach to the center post can tremendously help you level the tripod like this. These bubble levels, if they’re not already on your tripod, are usually specific to each tripod model so check with the manufacturer.

4. **Avoid using the center post.** The center post is significantly less stable than the three legs spread out, so only use the center post as a last resort or for very minor adjustments (a few inches). This will often cause some frustration in setting up your tripod to that perfect height, but just remember that it’s helping you get the sharpest image possible.

5. **Use an L-bracket for short lenses.** The “L” bracket is a special kind of plate that attaches your camera to the tripod head. It’s shaped like an “L” and allows you to mount your camera in portrait orientation while still keeping the camera at the center of the three legs. Here are a few photos that illustrate the difference between the L-bracket and a standard plate:

   ![L-Bracket and Standard Plate](image)

   The L-bracket has two big advantages: it keeps the center of gravity where the tripod can best support it (at the center of the three legs), and it gives you a few more inches of height when you’re shooting in portrait orientation (these few extra inches can certainly make or break a photo!).

6. **Use a tripod collar for long lenses.** Since big heavy lenses will often shift the center of gravity of your camera, it’s important to use a tripod collar that evenly balances the weight between your camera and lens. Without one, you'll surely notice how your camera has a tendency to slowly shift down after you lock the tripod head in place.
7. **Hang a camera bag or heavy object from the center post for extra stability.** If you find yourself in some super windy conditions, it might help to add some more weight to your tripod by hanging something (like a camera bag) from the center post. Many tripods already have a hook in place, but if yours doesn’t, then check to see if you can just screw in a hook from a hardware store. Be careful with this method though: if your camera bag is shaking a lot in the wind and hitting the tripod legs, you might actually lose stability. In extremely windy conditions, you might also want to try holding down the tripod with your hands.

![Image of a camera set up in windy conditions](image)

When I shot the photo above, it was extremely windy. So windy that if I hadn't held down my tripod, it would've been knocked down by the wind!

Although setting up your tripod may seem like a slow and tedious process, it’s important to do it carefully to ensure you get the sharpest image possible. Ensuring that your tripod is in a stable position will also help prevent it from toppling over and damaging your camera and lens.

And finally, the more time and care you take in setting up your tripod, the more you’ll be forced to concentrate on your composition. Knowing that it’s going to take you a long time to set up that tripod, you’ll be more careful about what composition you choose.

**Improvising a tripod.** When you can’t use a tripod, try to improvise with the objects around you. The goal is to keep your camera steady, so look around and see if there are any objects (such as trees or rocks) that you can use to rest the camera on or lean your body against. Any amount of support can help you get sharper photos!

**Handholding your camera.** When you’re stuck handholding your camera, there are some techniques you can use to help stabilize it:

1. **If you’re standing, keep your elbows in and rest them against your body.** This helps give your camera some extra support, especially when using long lenses.
2. **If you’re squatting, rest your elbows on your knees.** This gives your camera extra support while you’re squatting.

3. **Don’t tense up.** Keep your hands firm, but don’t make them too tense because that will only cause the camera to shake.

4. **Hold long lenses at their center of gravity.** When holding a long lens, one hand should be on the camera, and the other hand should be right under the center of gravity of the lens (which is where the tripod collar is attached).

5. **Press the shutter button halfway first.** To prevent the camera from shaking too much, it helps to press the shutter button halfway first, pause for a brief moment, then press it all the way down. Also, press it softly—if you apply too much pressure, it’ll shake the camera.

6. **Shoot a bunch of photos in a burst.** To help increase your chances of getting a sharp photo, enable continuous shooting on your camera and hold down the shutter button until you take at least three shots.

7. **Hold your breath while pressing the shutter.** If you watch closely, you’ll notice that the camera moves a little as you breathe, so to stop that movement, hold your breath while pressing the button.

**Relative vs. Absolute Sharpness**

In nature photography, sometimes it’s easy to fall into the trap of thinking that everything needs to be as sharp as possible, as if sharpness were the most important aspect of a nature photo. Although sharpness does matter, it’s important to understand that relative sharpness is much more important than absolute sharpness.

Absolute sharpness is about making your subject as sharp as possible, within the limits of your camera and lens. On the other hand, relative sharpness is about making your subject as sharp as possible relative to other elements in that image.
For example, here’s a photo with a lot of absolute sharpness:

![Dragonfly Image]

Everything in this photo was perfect for making that dragonfly as sharp as possible: I positioned my camera so its sensor was parallel to the dragonfly’s body, I used one of the sharpest apertures of the lens, I waited until there was a break in the wind to keep everything still, I used a tripod, I kept the shutter speed fairly fast, and I shot a bunch of photos in a burst. The result? A very sharp dragonfly.

Here’s a photo with not much absolute sharpness but a decent amount of relative sharpness:
The sage branch in the center of the frame isn't nearly as sharp as it could be. But relative to the background, it's sharp enough to stand out and give the perception that it's sharp. It's also just a little more in focus than the branches on the sides of the frame, making it stand out more. So it's not as sharp as possible, but I would say it's sharp enough.

I think absolute sharpness is something great to strive for, but if you overemphasize it, it can really get in the way of your creativity and prevent you from creating good images.

For example, maybe you once chose not to photograph a butterfly because you couldn't get in a position that made your camera's sensor parallel to the body of the butterfly (while also having a good background from that position). In that case, you could've just tried photographing the butterfly from the good background perspective and sacrificed a bit of sharpness.

Sometimes you're lucky and can capture your subject with a lot of absolute sharpness and still have the artistic composition you were hoping for, but don't let a little sacrifice in sharpness stop you from capturing an otherwise good photo.

The thing to keep in mind about sharpness and focus is that the viewer will usually look to the sharpest part of the image first. They don't care too much about absolute sharpness—they just care about what's sharpest relative to everything else in the image (and it could be that everything is sharp too, like in a landscape). There's a certain point, of course, where things would be considered “blurry,” but I think you know what I'm trying to say here.

**Things to Remember**

- Two things affect the sharpness of your photos: movement of your subject and movement of your camera
- To help battle the movement of your subject, you can use a fast shutter speed, wait until it stops moving, track your subject, or just emphasize the movement in your photo
- To help keep your camera still, you can use a tripod, improvise a tripod, or hold your camera carefully
- Relative sharpness is much more important than absolute sharpness
9 — Perspective

“A good photograph is knowing where to put the camera.” — Ansel Adams

Perspective is all about understanding how your camera’s position will affect the look of your photos. As you move your camera around, you’ll get completely different perspectives in your photos, and the relative sizes of objects will change.

So how do you know where to put your camera? Well, there are a few areas we’ll explore that’ll help you make this decision:

- Adjusting the relative sizes of objects in your photo
- How the height of your camera communicates emotion
- How to show depth in your image

**Adjusting the Relative Sizes of Objects in Your Photo**

There are two rules of perspective you should be familiar with:

1. The closer your camera gets to an object, the larger it will appear in the image

2. As you move closer to your scene, the closest objects will increase in size faster than the distant objects

The first rule is pretty obvious and easy to understand, but the second one might sound a little confusing. It’s best illustrated with an example, so take a look at this photo from the Eastern Sierra of California:
In this photo, I was standing about 100 ft (30 m) from those boulders in the foreground. As a result, the dominant object in this shot is the mountain in the background, which stood miles away from the boulders.

Now, look what happens when I move just 50 ft (15 m) closer to those boulders:

All of a sudden, the mountains in the background don’t look so mighty, and now those boulders in the foreground are the dominant objects. Those boulders got bigger in the frame while the mountain got smaller (relatively) because as I got closer, the close objects (the boulders, in this case) got bigger in the frame faster than the far objects (the mountains).

The second photo has a drastically different feeling than the first one. The perspective you choose for a photo will depend on the feeling you're trying to communicate.

Personally, in this case I prefer the first photo, because as I stood there in front of the scene, I felt like the mountain was in charge; it had an overpowering effect on me. So I decided to give it an overpowering effect in the final image. There’s no right or wrong answer here though. The important thing is understanding how the position of the camera changed the scene—quite drastically!

This concept is also important to understand for close-up photography, because it can help you control what’s in the background. As you move farther away from your subject, it'll get smaller relative to the objects in the background. The result is that it gives you more control of what's in the background. This is one reason why long lenses are so useful for close-ups.
How the Height of Your Camera Communicates Emotion

As you adjust the height of your camera in relation to your subject, you'll communicate different emotions in the photograph. Basically, you have three options: photograph your subject from above, at the same level, or below.

1. **Above.** Photographing your subject from above will give the viewer a sense of superiority over the subject. When we look down on something, we naturally feel bigger than that something. It's the reason why mountains don't look so tall when you're standing on a peak somewhere, looking down on other mountains—like in this photo:

![Mountain Landscape](image1)

2. **Level.** When your camera is at the same level of your subject, the photo will have a more welcoming or friendly feeling. Getting down to the eye level of your subject helps put you in their world and get their perspective on things. This works extremely well for photographing wildlife, insects, or flowers. Anytime you want your subject to appear friendly, keep the camera at the same height as your subject.

![Birds](image2)
In order to capture this friendly photo of a snowy plover, I laid down on the sand to get my camera at eye-level with the bird. Getting down to eye-level isn’t always the most comfortable thing to do, but the results are worth it.

3. **Below.** When your camera is positioned below your subject, the viewer will feel overpowered by your subject since it’s towering over them. This works great whenever you want to emphasize the large size of a particular subject (or make a small object, like a bug, look bigger). The classic example is photographing a tall mountain or rock formation from the bottom:

![Image of a mountain from below]

How to Show Depth in Your Image

One of the common goals of photographing a landscape is to show depth—either to show the viewer how vast a landscape is or to help lead the viewer’s eye from the foreground into the background.

Here are a few ways to capture depth in your images:

1. **Focus on elements that lead the viewer’s eye.** The general thing to remember with capturing depth is to focus on elements that naturally lead the viewer’s eyes through all dimensions of the image. These could be things like a fallen tree that points towards the back of the frame and leads the eye to the base of a mountain, or a bird looking towards the other end of a frame.

   When you lead the viewer's eye through the frame like this, it makes the viewer feel like they’re traveling through the image—which translates to a feeling of depth.
For example, in the image above there’s a natural path that starts wide in the bottom of the frame and gets narrower as it moves back in the frame. This helps guide the viewer through the image, creating depth.

2. **Get above the landscape.** One of the simplest ways to add depth to a landscape is to get above it. Look around for big rocks you can stand on, or see if there’s a short hill nearby (please be careful not to disturb any plants though). Or if you’re photographing a landscape from the road, you can do what Ansel Adams did: just get on top of your car!

Getting above the landscape helps give you a wider view of what’s below. Think about the difference between seeing a city while standing on the street versus seeing it from the top floor of a skyscraper. Neither view is necessarily “better” than the other, but the view from high up in the skyscraper would show more vastness to the city.
In order to show the wide-open space of the Mojave Desert in the photo above, I shot the photo from a small hill—I was about 4–5 ft above the landscape.

3. **Photograph your subject from an angle.** If your image focuses around a single large feature, like an interesting rock formation or canyon, then another thing you can do to show depth is photograph it from the side, at an angle.

For example, compare these two images of one of my favorite canyons in the Mojave Desert:

The first image is a direct shot of the canyon walls—my camera’s sensor for this image was parallel to the wall of the canyon. In the second image, I switched to a wide-angle lens and looked down the canyon at an angle—this helps show depth because as the canyon walls get farther in the background, they also get smaller.
Here's another example of this idea, but with a close-up instead of a landscape:

![Red Maids Flower](image)

I could have photographed this red maids flower from the side or by looking directly into it, but instead I chose to photograph it from an angle like this in order to show depth. It would've looked much flatter if I shot it from the side or by looking directly into it.

4. **Include lots of near, mid, and far objects.** Depth is another word for deep, so in order to show depth, you want to capture a lot of space. One simple rule of thumb to do this is to make sure you include a variety of near, mid, and far objects.

   This works even better if you have similar objects at different distances, because the human eye knows these objects are the same but sees them getting smaller as they move back in the frame and that makes the viewer process the scene as three-dimensional.

   If instead you just have near and far objects, the image will have less depth because the viewer will have less space to look and travel through. It'll seem like there’s a sudden “jump” in the image from near to far.

**You don’t always need depth.** It’s important to remember that you don’t always need depth in an image. Sometimes that might not be the message you’re trying to send with a photograph—and that’s okay! Personally, I photograph a lot of distant landscapes with telephoto lenses, and these naturally show very little depth (not a bad thing at all).

But in those cases where you do want to show depth, consider some of the ideas listed above. You don’t need to include them all; just use what works for your vision.
Here’s an example of a wildflower photo that doesn’t really have any depth, but it still fulfilled my vision:

![Nature Photography: Understanding the Camera](image)

I love how California poppies look from the side when the sun is directly overhead and “lighting up” the flower, like in the image here. And those shadows are pretty wonderful too. There’s not much depth in this photo, but like I said, you don’t always need depth.

**Things to Remember**

- The closer your camera gets to an object, the larger it will appear in the image
- As you move closer to your scene, the closest objects will increase in size faster than the distant objects
- Photographing your subject from above will give the viewer a sense of superiority over the subject
- When your camera is at the same level as your subject, the photo will have a more welcoming or friendly feeling towards the subject
- When your camera is positioned below your subject, the viewer will feel overpowered by your subject since it’s towering over them
- To show depth in your images, you should include elements that lead the viewer’s eye through the image, photograph your subject from above or at an angle, and/or include lots of near/mid/far objects
- There’s no hard-set rules about perspective that you have to follow, but it’s helpful to be aware of different concepts of perspective to help you create images that fulfill your vision
10 — Light

Light is something you have very little control over in nature photography, but it has a big effect on the look of your photographs.

First, we’ll talk about the different lighting conditions you’ll come across: clear skies, partly cloudy, overcast, shade, sunrise, and sunset. Then we’ll talk about the different angles of light: front, back, and from the side.

And since the light isn’t always perfect, we’ll also talk about a few ways you can control the light to make it a little more pleasing.

Types of Light

1. **Clear skies** produce the brightest and most harsh natural light. Without any clouds in the sky to soften the light, the sun will shine brightly on everything and create harsh shadows (shaded areas will be extra dark).

   This usually makes exposure difficult for things like wildflowers because your camera cannot capture that wide range of brightness (everything from the bright colors of the flower to the dark colors of the shadows).

   Clear skies are great for times when you need a fast shutter speed, because there’s always plenty of sunlight available. They’re also great for capturing dark shadows, which is helpful for photographing jagged mountains or hills because it helps emphasize texture and depth.
Clear skies helped me get the photo above of a loggerhead shrike, because it helped me get a faster shutter speed. The fast shutter speed was important because the birds move quickly, and I was handholding my lens.

2. **Overcast skies** produce the softest and most diffused natural light. Under these conditions, there are virtually no shadows, so the light on your subject will be very balanced (which usually makes colors stand out more). This is great for photographing things like wildflowers or any kind of close-up where you want to emphasize color over depth.

Notice how there aren’t any shadows in the image above of a Bigelow’s monkeyflower? That’s because I shot the photo under overcast skies. It created a wonderful balanced and diffused light.

3. **Partly cloudy skies** are kind of a mix between clear and overcast skies. When the sun sneaks behind a cloud, you get a somewhat diffused light (but not as strong as you’ll see under completely overcast skies). These conditions are good for when you just want a slightly diffused light (great for photographing perched birds or insects).

Partly cloudy skies are also good for photographing landscapes that you plan to convert to black and white later. Clouds can add a lot of drama to the sky, and that drama is strongly emphasized when converted to black and white (because it strengthens the contrast between the dark sky and bright clouds). Here’s an example:
This photo of the Annapurna range in the Himalayan mountains was photographed near the middle of the day, and although the mountains are beautiful in this image, it’s the clouds that create most of the drama in this scene. I strengthened that drama by converting the image to black and white.

Although partly cloudy skies are good for a wide range of subjects, it’s also annoying to photograph stuff under these conditions because you’ll have to constantly adjust your exposures as the sun peeks in and out of clouds.

4. **Shade** produces balanced light that’s similar to overcast skies. But colors don’t usually stand out as much under shade as they do with overcast skies. Shade is usually much darker than overcast conditions, so it also means longer shutter speeds (which can become an issue when you’re photographing something that’s moving). Sometimes it’s good for wildflowers or anything that’s not moving (allowing you to use longer shutter speeds and still get sharp photos).
This photo of blue-eyed grass was shot in the shade. Luckily it was staying pretty still, so I didn’t need a fast shutter speed. The colors don’t “pop” as much as they would have under overcast skies, but it’s still a pleasing image.

5. **Sunrise** tends to produce a somewhat cold light (i.e. sunrise colors usually have more of a blue tint than sunset colors). It’s an excellent time to capture some stunning colors in the sky, especially if the clouds cooperate. Also once the sun has risen, you have about a 15-minute window to capture some excellent light on the landscape. In these first 15 minutes after sunrise, the sun casts a very warm light on the landscape, which really helps saturate your images.

6. **Sunset** tends to produce a warm light (sunset colors are usually more red than sunrise colors). Like sunrise, it’s also an excellent time to capture some awesome colors in the sky. And also like sunrise, when the sun is low on the horizon, it casts a very warm light on the landscape, which is great for capturing powerful landscape images.

Here’s a photo that shows how much the colors of the landscape can change with the warm light of sunset:

![Sunset photo](image)

In the image above, the mountains are bright red just before sunset, but normally during the day they’re dark brown/gray. For comparison, here’s a photo of the same mountain range that was shot earlier in the day, under cloudy skies:
In this photo, the mountains now look dark gray/blue with a hint of purple—a totally different look! Neither image is necessarily “better” than the other, but there is a drastic difference between them, and it’s all because of the light.

7. **Moonlight** is an often-overlooked type of light, but it’s another lighting condition you should consider because it produces a very unique look. A landscape that’s lit by the moon will have a bluish tint and will have an eerie look to it (great for photographing desert scenes!). If you photograph a landscape when the moon is still somewhat low on the horizon, you’ll also get some nice moon shadows in your image.

You might think that the best time to photograph a landscape under moonlight is on the night of a full moon, but you might also want to experiment with nights where the moon is only partly full. This will help you capture more stars in the sky, because as the moon gets more full, it also makes it harder to see (and photograph) the stars.

**Angles of Light**

1. **Front lighting** occurs when the sun is shining directly on your subject, so with front light, you’re unlikely to capture any harsh shadows. It’s excellent for photographing wildlife or butterflies because it ensures there won’t be any harsh shadows that hide detail:
2. **Back lighting** is when the light source is actually behind your subject. This is great for subjects that are translucent, because it helps amplify some of their striking features. A classic example is the backlit leaf photograph:

Notice how the veins in the leaf really stand out here? That's because the light source was behind the leaf when I photographed it. Since the leaf is translucent, the backlight gave it a kind of “stained glass” appearance.

Backlight also works great for silhouettes when you want to emphasize the shape of your subject, like in this photo of a Joshua tree:
3. **Side lighting** occurs when the sun is shining to the side of your subject. Depending on the angle, it may produce some big harsh shadows, but sometimes these shadows can help show depth in your subject. Mountains or canyons are usually good subjects for side lighting because those shadows help emphasize ridges and detail in the canyon walls. Sand dunes are also good subjects for side light, as it creates strong shadows in the ripples of the dunes:
Controlling Light

Sometimes the natural lighting conditions aren’t always perfect for what you want to photograph. For example, you might be hiking on a beautiful sunny day and then come across the most wonderful wildflower. Although wildflowers certainly look good in bright light, let’s say you’d prefer to get an image without those harsh shadows. What do you do then?

Well, luckily there are a few ways you can control the light when it’s not perfect. You can do this by using light diffusers, shaders, and reflectors.

1. **Diffusers.** If the light is too harsh and creating too many shadows on your subject, then you can use an artificial light diffuser to balance and soften the light. This helps simulate the effect of a cloudy sky and is really useful in places like the desert where most days are bright and sunny.

   Camera stores sell all kinds of light diffusers, but you can also make your own for about $5 using a wire clothes hanger and a shower curtain or any material that’s at least medium transparent and clear/white. Just bend the hanger into a square and then cut out some of the shower curtain to place over the wire frame, tape it on there, and you’re done! The homemade diffuser should look something like this:

   ![Homemade Diffuser](image)

   In the example above, I used a garbage bag instead of a shower curtain.

   Using a light diffuser is easy—just hold it between the sun and the subject you’re photographing. Make sure you’re holding it in such a way to diffuse *all* the light that’s shining on your subject. Depending on your vision, you may or may not want to diffuse the background light too.

   Also, you can adjust how strongly the light is diffused by changing the angle of the diffuser. For the most subtle level of diffusion, keep the diffuser perpendicular to the sunlight. As you get farther away from that ninety-degree angle, the strength of the diffusion will increase (so you’ll get an even softer light on your subject).
Here’s an example photo that shows how a diffuser can help balance the light and eliminate harsh shadows:

2. **Shaders.** If a part of your image is just too bright, then you can also experiment with putting that part in shade. This works well when you want to draw more attention to your subject by putting the background in shade and keeping your main subject in bright sunlight (or vice versa). You can use almost anything to shade an object: your hat, a book, or you can even stand somewhere to block the sunlight.

Here’s an example that shows how well shading can work:

In the photo on the left, the flower is very bright from being in the sun, to the point of being almost all white and having some harsh shadows. In order to balance the light
some more, I shaded the flower (with my hat), but kept the background lighting as is (since those partially lit blades of grass add some great contrast to the image). The result is the image on the right—you might notice I changed the composition just a little bit too, to put more brightly lit grass in the frame.

3. Reflectors. It’s also helpful to carry something that can direct light where you need it in case you need to eliminate a shadow somewhere. Again, camera stores sell a variety of “professional” reflectors, but you can also experiment with less expensive solutions like aluminum foil, mirrors, or even white paper.

**Things to Remember**

- Clear skies produce the brightest and most intense light—they’re good for times when you need a fast shutter speed
- Overcast skies produce a very diffused and balanced light that eliminates shadows—it’s great for close-ups (especially wildflowers)
- Partly cloudy skies produce a partly diffused light—good for perched birds and insects
- Shade produces a balanced light but is usually much darker than overcast skies and the colors don’t “pop” as much
- Sunrise and sunset produce a very warm light that saturates the landscape
- Moonlight has a bluish tint and creates an eerie look
- Front lighting is great for wildlife and insects when you want a lot of light but no harsh shadows
- Back lighting is great for translucent subjects or silhouettes that highlight the structure of your subject
- Side lighting produces harsh shadows, but sometimes that’s good for showing depth
- You can control the lighting conditions somewhat with diffusers, shaders, and/or reflectors
11 — Composition

Composition is all about deciding what your vision and goal is for a photograph and then positioning your camera and setting it up so it fulfills that vision. It’s very similar to the concept of perspective.

Since composition is influenced so much by your vision, there’s no set of rules you always need to follow for a photograph to be “good.” There are some principles that you should be aware of though, and we’ll explore those principles in this chapter.

Finding Your Vision

When you first stumble upon a subject, don’t start taking photos right away. First, it’s important to think about your vision for portraying that subject in a photo. Ask yourself what inspired you to photograph that subject? What do you want to say about your subject? What makes it interesting? Thinking about these questions and their answers will help you figure out the best composition for your image.

Simplify

Once you figure out your vision for a photograph, then it’s important to start thinking about how you can simplify the frame, and only include those elements that help fulfill your vision. One of the most common mistakes beginning photographers make is including too much stuff in their photos. Before you snap that first shot, do a quick scan of everything in your frame and ask yourself: is this element necessary for what I’m trying to say with this photo? If it’s not, then try to find a better composition without that unnecessary element.

Rule of Thirds

The “rule of thirds” is probably the most common “rule” you’ll hear about in photography. Here’s how it works:

1. Divide the image in thirds, both horizontally and vertically
2. Important elements should be placed along these lines or at their intersections

For example, here’s a photo that follows the rule of thirds:
As you can see, I placed the main object (the plant) near the bottom left third of the frame where those two lines intersect. Also notice how I placed the majority of the ground near the bottom third too. I would’ve included all the ground at the bottom third if I could, but I couldn’t because the ground descended down on the right.

The rule of thirds works very well for horizons in landscapes (either putting the horizon at the bottom third or the top third), but you don’t always have to follow this guideline. For example, here’s a landscape where I put the horizon near the center of the frame:
I chose to put the horizon at the center in this photo because I wanted to show a balance between the beautiful colors of the sunset and the reflection of those colors in the wet sand. I did follow the rule of thirds in another way though by placing that large rock in the far left third of the frame.

**Color Theory**

In art, color theory is the idea that colors work together to create pleasing compositions. Before we jump into using color theory to guide your compositions, it’s important to first understand a few concepts about color.

There are three primary colors: red, yellow, and blue. These colors are special because they can be mixed to produce other colors such as the secondary colors: orange, violet, and green. The primary colors are often represented in a triangle (as shown below). If you draw a circle around this triangle and fill in the gaps with the secondary colors, you’ll get the color wheel:

![Color Wheel Diagram](image)

The color wheel (above on the right) helps show the relationships between all the colors. The most important relationship is that opposite colors are complementary to each other. For
example, red and green are complementary colors. Complementary colors are special because when they’re mixed, they produce a neutral tone that relaxes the eye.

When you apply color theory to composition, the basic idea is to create contrast in your images with colors that complement each other. There are seven types of contrast, but we’ll only talk about the four strongest types: contrast of hue, contrast of extension, light-dark contrast, and cold-warm contrast.

1. **Contrast of hue.** Contrast of hue is the idea of using colors that strongly contrast or complement each other. The strongest contrast will occur with the primary colors, so for example, composing an image with mostly yellow and blue will create a very strong composition.

   But you can also use other colors that complement each other. A classic example of a great wildflower composition is an orange California poppy in front of a blue sky. Orange and blue are complementary colors (remember that they appear opposite of each other in the color wheel), so the colors work together to create a strong composition.

   You don’t have to limit yourself to only two colors though. You can also mix triads of colors. A triad is created by moving that triangle in the middle of the color wheel. So for example, purple/orange/green creates a strong triad.

   Here’s an example that demonstrates contrast of hue:

   ![Contrast of hue example](image)

   Since red and green are complementary colors, they work very well together in the photo above.

2. **Contrast of extension.** Contrast of extension is the idea that certain colors should take up more space in a composition, depending on their brightness.

   So for example, consider the two colors purple and yellow, which are complementary colors.
Since yellow is about three times brighter than purple, the idea of contrast of extension says that yellow should only take up 25% of the frame. And purple should take up the other 75%. That way, the average brightness of the image is neutral gray, and this helps relax the human eye. The figure below shows the proper distributions for mixing other complementary colors:

![Color Distribution Diagram]

For example, to create a powerful composition with blue and orange, the blue should take up 2/3 of the frame, while orange should only take up 1/3. Purple/yellow has a 3:1 ratio, and red/green is 1:1.

It's important to note that these ratios of color distribution are for the pure forms of the color. So if there were a darker blue in the image, then you'd need to balance that with a lighter orange.

3. **Light-dark contrast.** Light-dark contrast is the idea of creating a composition with strong contrast of brightness. The strongest contrast in this case would be between black and white, but it also applies to colors (because colors also have brightness values!).

Here's a photo that demonstrates strong light-dark contrast:
The original color version of this photo above didn’t have much contrast (in terms of hue), but it did have a ton of contrast in terms of brightness. My original vision for the photograph was to convert to black and white anyway, because I immediately appreciated the brightness contrast of the scene. One of the key aspects of the photo is that those mountains in the background are completely black, and the pinnacles in the foreground are much lighter (almost white). I purposely waited for a cloud to shade those mountains in the background to help create this strong contrast. As a result, those pinnacles really stand out.

4. **Cold-warm contrast.** Cold-warm contrast is the idea of contrasting cold colors with warm colors. Cold colors include anything with a bluish or green tint, and warm colors include anything with a reddish or orange tint. When using cold-warm contrast, it’s important to keep brightness values relatively equal.

Here’s a photo that demonstrates cold-warm contrast:

![Cold-warm contrast example](image)

The cold (blue) color of the sky contrasts well with the warm (red/brown) color of the rocky hill. Normally those rocks are a dull brown color, but since this photo was shot a few minutes after sunrise, there was a beautiful warm glow across the landscape—a magical moment in the Sonoran Desert.

**Guiding the Viewer Through an Image**

When you look at a photograph, you don’t view it as a whole. Instead, you first focus on one key area that grabs your attention and then you move your eyes throughout the rest of the frame to see what else is there.

Where your eye travels from that first spot depends on the image and how that spot guides you to another spot in the frame. In an image that has good “flow,” your eye will always know where to go next (elements of the image will guide you). But if an image doesn’t have a natural
direction of flow, it’s harder for the viewer to move through the image (they don’t know where to start and then they don’t know where to go from wherever they started).

The key to guiding your viewer through an image is to pay close attention to the natural lines in your composition.

For example, here’s a photo I shot of a sunset, with the natural lines highlighted by the green arrows on the right:

With such a beautiful sunset, I composed the image in a way that helped lead the viewer’s eye from the foreground up towards the sky. All the plants have natural lines that help guide the viewer up towards the top of the frame. Without these natural lines, the viewer’s eye wouldn’t travel as easily through the image. The viewer might look at one spot and then not know where to go from there.

These natural lines can also be “subjective”—the classic example is eyes of wildlife. In wildlife photographs, the viewer will almost always first look at the subject’s eyes, and right after that they’ll look at where those eyes are looking.

Here’s another example of an image with good natural lines that guide the viewer:
The lines in this image should be obvious, they all point from the lower left of the frame towards the top right. I took a bunch of other photos of this plant (Yucca whipplei) that day, but none of the other photos had the strong natural lines of this one.

**Study Other Photographs**

I think one of the best ways to build your image composition skills is to study lots of photographs from other photographers and ask yourself why you like or dislike each photo. Really spend some good quality time analyzing each photo. Luckily it's easy to do this these days with so many wonderful places online to find great images (such as Flickr, 500px, Instagram, etc).

When you're studying images like this, the goal isn't to copy other people's ideas and compositions—the idea is to help you articulate what you think makes a photo “good” or “bad.” It's a wonderful way to discover your vision without taking any photos.

**Things to Remember**

- Composition is all about deciding what your vision and goal is for a photograph and then positioning your camera and setting it up so it fulfills that vision
- When possible, simplify your compositions—take out anything that doesn’t contribute to your vision for the photo
- The rule of thirds is a principle that says dominant objects in an image should be off center, on the thirds of the frame
- Use color theory to help guide your compositions
- Help guide your viewer through an image by paying close attention to natural lines
- Study photographs from other photographers for inspiration and to discover your unique vision
12 — Lenses

Camera lenses have a very important job: transmitting light and focusing it onto the image sensor. They’re often under-appreciated in terms of the complex engineering that goes into building them. You don’t need to understand all the optical technology inside of them, but there are a few things you should know about lenses.

Focal Length

Focal length is the most general way of describing lenses. It’s basically the size/length of the lens (it’s a little more complicated than that, but we’ll keep things simple here and stay away from the details of optical science). It’s usually expressed in millimeters (e.g. 100mm).

Focal length is important to understand because it tells us the field of view of the lens. The field of view is the angle/range of what you see through the lens. For example, binoculars have a narrow field of view because they restrict your vision to a very small area.

Lenses are usually placed into four different groups of focal length: wide angle, normal, telephoto, and super telephoto. Here’s an overview of these groups:

1. **Wide angle (10–40mm)**. The wide-angle lens is the classic landscape lens because the short focal length allows you to capture a very wide angle of the scene in front of you. It’s great for capturing scenes like this (where I used a lens at 20mm):

2. **Normal (50mm)**. The 50mm lens is called “normal” because it represents the approximate angle of view (about 55 degrees) that our eyes have. So a 50mm lens will capture a scene as our own eyes see it.
3. **Telephoto (50–300mm)**. The telephoto lens has a very narrow field of view, so it’s great for photographing close-ups and distant landscapes.

Below is a close-up of a pitcher sage that I shot with a 200mm lens. The telephoto lens helped me isolate the flower against an out-of-focus background.

Here’s an example of a distant landscape shot with a telephoto zoom lens at about 140mm:
4. **Super Telephoto (more than 300mm)**. With their extremely narrow field of view, these lenses are great for photographing subjects you can't get very close to, such as wildlife. Sometimes they're also useful for close-ups when you want to isolate your subject against a very small part of the background.

In order to photograph the Cooper’s hawk below that was far away from me, I needed the narrow field of view from a long lens (400mm):

![Cooper’s hawk](image)

### Maximum Aperture

Every lens has a maximum aperture, which is called the “speed” of the lens. For example, you might see a lens labeled as “70–200mm f/4”—this means the lens covers the focal lengths from 70mm all the way to 200mm and the smallest f-number you can use on the lens is f/4. In this case, the speed of the lens would be f/4.

A lens is considered “faster” than another lens when its maximum aperture is wider. The word faster here means it can let in more light. So for example, an f/4 lens is faster than an f/5.6 lens. In general, lenses at f/2.8 or faster are considered “very fast” (unfortunately, they're very expensive too!).

### Zooms vs Primes

Zoom lenses give you a range of focal lengths (e.g. 70–200mm), and prime lenses have a fixed focal length (e.g. 50mm). In general, prime lenses are faster than zoom lenses (in terms of maximum aperture). Primes are usually a little sharper too, but with the latest zoom lenses, the difference in sharpness isn't much.
**Lens Stabilization**

Many newer lenses (especially zooms) have some kind of stabilization technology that helps stabilize the lens while you're handholding it. Every camera manufacturer has a different name for it, but they all work the same.

Although lens stabilization works very well on a lot of lenses, I think it's a good idea to still use a tripod when possible. Think of the lens stabilization as a backup or for when you have no choice but to handhold your camera.

When you put a lens with stabilization on a tripod, make sure you turn off the stabilization. If you keep it on, some lenses will look for movement and as a result cause the lens to shake.

**Minimum Focus Distance**

Every lens has a minimum focus distance, which is the closest distance that the lens will focus at (the lens will not be able to focus on anything that's closer). In general, as the focal length increases, the minimum focus distance also increases.

You usually only have to worry about the minimum focus distance for close-ups, like wildflowers or insects. Luckily, there's a simple accessory you can use to focus closer with your lenses (which we'll talk about in the next chapter on accessories).

**Macro Lenses**

Macro lenses are specialized lenses that are built to focus extremely close—usually within a few inches. They usually come in two different focal lengths: 60mm and 120mm (or somewhere around there, depending on the manufacturer). For nature photography, you'd definitely want the longer lens because you'll rarely be able to get close enough to subjects with a 60mm lens (unless you're just photographing plants). But the other benefit of the longer lens is that it gives you a more narrow field of view so you have more control of what's in the background.

**Teleconverters**

Teleconverters are another type of specialized lenses that attach to other lenses to extend their reach. Most camera manufacturers make a 1.4x and a 2x extender. This means that they extend the focal length of a lens by a factor of 1.4 or 2. For example, if you attach a 1.4x teleconverter to a 300mm lens, then it becomes a 420mm lens. If you attached a 2x to the same lens, it'd become a 600mm lens! Teleconverters are great inexpensive options for extending the reach of your lenses. There are a few drawbacks to them though:

1. **They reduce the maximum aperture of the lens by one or two stops.** The 1.4x extender will reduce the max aperture by one stop, and the 2x will reduce it by two stops. For example, if you put a 1.4x on a 300mm f/4 lens, then it becomes an f/5.6 lens.
2. **They reduce image quality.** Usually, the 1.4x reduces image quality just a little bit, but the 2x usually reduces image quality by a noticeable amount.

3. **They usually only work on longer lenses.** Before you get a teleconverter, make sure it works with the lens you want to use it with. Typically, they only work with a few lenses and it’s usually the longer lenses made by the camera manufacturer.

Despite these drawbacks, teleconverters are still very useful, especially when you need a longer lens for photographing wildlife. They’re also useful for close-ups sometimes.

**Focal Length vs Perspective**

In photography, there’s a common misconception that focal length determines the perspective of an image, but the only thing that really determines perspective is where you put the camera (as we talked about in the chapter on perspective).

For example, the telephoto lens is often said to “compress” your scene and make everything look flat. But it's not the focal length that’s doing this. It’s actually because you’re so far from the scene you’re photographing (which is how telephoto lenses are commonly used: to photograph something far away). And it’s because of this great distance that the scene looks “flat” in the final image.

As you move farther and farther away from something, you lose visual depth. For example, if you stare at someone’s face when you’re only a foot away from them, you’ll be able to see all the curves of their face pretty clearly. But as you step farther away from them, their face will begin to look “flat.”

So when you decide to photograph a particular subject, choose your perspective carefully. The perspective you choose will determine the feeling you communicate with the image. If your image has foreground elements and background elements, then also consider how you want that foreground to relate to the background. Remember that as you get closer to foreground elements, they’ll get larger at a much faster rate than elements in the background.

Once you find that perfect perspective, your next step is to find the appropriate focal length to fill the frame with your desired image. As you take more photos with different focal lengths, you’ll be able to instantly determine the lens you need.

**Recommended Lenses for Nature Photography**

What lenses you should have depends on the style of photography you’re interested in. If you’re interested in a little bit of everything, then it’s good to have lenses that cover the range between 16mm and 300mm. With that range, you’ll be able to photograph just about everything; however, some subjects like birds and other wildlife might be difficult.

If you want to start off simple or just keep things simple forever, then the most versatile focal length range would probably be 24–135mm. Most camera manufacturers make a zoom lens in this range, so this way you’d only have to worry about one lens. It’s a good place to start. Then
after awhile, look at your photos and see where they usually end up. If most of your photos are shot at the longer range (e.g. 100mm or longer), maybe you should get a long telephoto next.

**Things to Remember**

- Lenses are usually described by focal length and maximum aperture
- The focal length of the lens describes how long the lens is
- The maximum aperture of a lens is the smallest f-number you can use
- Prime lenses have a fixed focal length and are usually faster than zoom lenses
- Lens stabilization helps stabilize the lens when you’re handholding it
- The minimum focus distance of a lens is the closest distance the lens will focus at
- Macro lenses are specialized lenses that are built to focus extremely close
- Focal length does not determine perspective, only the position of the camera does
13 — Memory Cards

Memory cards are an often-neglected part of digital photography. After you take a photo though, they become the most important part of your camera because they’re responsible for safely storing your photos until you get home.

Types

There are currently two popular types of memory cards: CompactFlash (CF) and Secure Digital (SD). CompactFlash used to be the standard because they used to be much faster than SD, but the technology has improved a lot over the years with SD, so SD is the future of memory cards. Most newer cameras will use SD.

Properties

If you look at a memory card, you’ll notice that there are a bunch of numbers and weird acronyms on them. Here’s what everything means:

1. **Maximum read and/or write speed.** This number can be confusing because it can either refer to the maximum read and/or write speed. It’s possible for these speeds to be different, so make sure you read the specifications of the memory card to understand exactly how fast it is.

2. **Type.** This is the type of the memory card in terms of storage capacity. In the example above, SDXC stands for Secure Digital eXtended Capacity. If you get larger memory cards (32GB or more), make sure your camera supports the specific type of cards you buy.
3. **UHS rating.** This refers to the maximum bus speed that the card can read/write at. Here are the speeds at different ratings:

   - UHS-I — as fast as 104 MB/sec
   - UHS-II — as fast as 312 MB/sec
   - UHS-III — as fast as 624 MB/sec

   In order to take advantage of these speeds, your camera needs to support them. So before buying a memory card, make sure you know the fastest UHS rating your camera can support.

4. **Speed-class rating.** This is an older speed-class rating that some memory card manufacturers still print on their cards. It refers to the minimum continuous write speed of the card, and in the example here that speed is 10 MB/sec.

5. **UHS speed-class rating.** This refers to the minimum continuous write speed of the card. Here’s what the different classes mean:

   - Class 1 — minimum 10 MB/sec write speed
   - Class 3 — minimum 30 MB/sec write speed

   You might be wondering how this differs from the UHS rating that was described before. Well, the UHS rating is the maximum possible speed of the card, while the speed-class rating is the minimum sustained write speed of the card. The actual speed of the card can vary greatly over time, but cards should have a minimum and maximum speed. The minimum speed is important for video.

6. **Capacity.** This is the size of the memory card. It’s helpful to know the general size of RAW/JPEG photos your camera creates so you can easily determine how many images you can fit on a card when you’re shopping for them.

### Does Speed Matter?

There are two occasions when the speed of your memory card matters:

1. When you’re shooting lots of images in a burst (more than 3 in a row)
2. When you’re copying images from your memory card to your computer

If you photograph a lot of wildlife or other fast-moving subjects, then you’ll definitely benefit from fast memory cards. If you use slow cards, then when you shoot images in a burst, your camera will have to pause a lot to finish writing the images to the memory card. This could make you miss a photo opportunity.

But if you photograph mostly still subjects like landscapes, then you probably won’t benefit much from fast memory cards. Sure, you’ll be able to copy images faster to your computer, but that might not be enough of a benefit to justify the cost.
How to Avoid Problems

Just like any kind of technology, a lot can go wrong with memory cards. And the last thing you want to happen is losing all your photos after capturing some spectacular shots, right? So here are a few tips for avoiding problems:

1. **Format a new memory card as soon as you get it.** Even if your memory card came “pre-formatted,” it’s still a good idea to format them again with your own camera. And only format the card from the camera itself (and not when it’s inside a card reader connected to your computer). This will make sure the memory card is using a file system the camera recognizes.

2. **Use multiple small cards instead of one big one.** With the huge memory cards available today, it’s tempting to just buy the largest one so you won’t have to switch cards. But what if your 128GB card fails? Then you just lost thousands of photos! That’s why you should use multiple smaller cards to spread out your photos and reduce the probability that you’ll lose them all at once. I like to use card sizes that store about 1,000 RAW photos (the card size required for this varies between cameras).

3. **Always leave a few extra shots on your memory card.** Your camera probably has a number on the screen that tells you how many photos you can take before your memory card is full. This number is only an estimate, so if you happen to take a photo when your card is actually full, you may corrupt the data on the card. To avoid this problem, always leave some extra space on the card.

4. **Always safely “eject” your memory card from the computer.** When you’re done transferring your photos to your computer, make sure to “eject” the card properly, and don’t just yank it out of the reader (or yank out the USB cable). On Windows, there should be an icon in the lower right corner of your screen for safely removing USB media, and on Macs, you can just press the eject symbol in the finder window. This is important because although you may think the computer is no longer reading/writing to the card, it may still be accessing it for some reason. Ejecting it will tell the computer to stop communicating with it so you can take it out safely.

5. **Format your memory card instead of deleting all photos.** Formatting your memory cards is sort of like resetting them and making them “fresh” again. It will help correct any disk errors that may have occurred during your last shoot.

6. **Store your cards in a safe place.** It’s important to protect the contacts on your memory cards because the smallest piece of dust can cause reading/writing problems and ultimately loss of photos. To protect them, always store them in the case they came with (or get some if they didn’t come with a case), and don’t leave them lying around on your desk.

7. **Turn off your camera before removing the memory card.** Although this may seem like a no-brainer, there have been a few times where I almost forgot to turn off the camera before removing the memory card. If you yank out the card with the camera on, there’s a chance you may remove it when the camera is reading/writing to it, which could
potentially damage files on the card.

8. **Use a good-quality card reader.** Although the reader merely reads the memory card, there's still a chance it can damage the card. That's why it's important to always use a good quality reader. The best thing to do is use a reader made by the same manufacturer as the cards you use.

9. **Don’t push your batteries to the limit.** If you push your batteries to the limit and wait until they completely run out of energy, then there's a chance they’ll run out at the exact moment your camera is writing to your memory card (which could cause data loss). To avoid this possibility, put in a fresh battery as soon as your camera indicates the current one is low.

10. **Don’t use the same card on multiple cameras.** If you used a card to take 40 photos on one camera, don’t put it in a different camera to take more photos. The two cameras (even if made by the same manufacturer) may have different file system requirements or architecture, so mixing them between cameras could corrupt the data on the card.

11. **Only use good-quality memory cards.** Photos are known to disappear “mysteriously” with cheap, off-brand memory cards, so always buy good-quality cards. You don't have to get the top-of-the-line, super-mega-fast 10,000X warp speed gold-plated cards, but you shouldn't get the no-name cheap ones either. Personally, I’m a big fan of SanDisk.

**Things to Remember**

- There are two common types of memory cards: CompactFlash (CF) and Secure Digital (SD)
- Each memory card has a minimum and maximum read/write speed
- To use the faster cards, make sure your camera supports them (check your manual)
- Faster cards will mostly just help when shooting lots of photos in a burst, such as photographing wildlife
- In order to avoid problems, make sure you take care of your memory cards
Nature Photography: Understanding the Camera

14 — Accessories

All you really need for nature photography is a camera and a lens (well, and a tripod too of course!), but there are also a few accessories that can help you in various ways. Here are a few I recommend:

Filters

Filters are pieces of glass that screw on to the front of your lens. Different filters have different effects. Here are the ones I recommend:

1. Polarizer. The polarizing filter helps reduce reflections and deepens the blue of the sky. They work best on the sky when your camera is pointed at a 90-degree angle from the sun. You can certainly use it at other angles, but the effect will quickly diminish as you move farther from that 90-degree angle. They're a must have if you do a lot of landscape photography.

Here's an example of what the polarizing filter can do:

Notice how the blue sky is almost black at the top of the image? That's a result of the polarizing filter—it darkens and deepens the color of the sky. It's not always an effect you want, but it works great when you want to increase the contrast between the clouds and sky. This is especially useful when you plan on converting the photo to black and white later, because it helps make the sky almost black while keeping the clouds white—that strong contrast creates a dramatic effect in the image.
The other thing polarizing filters can do is reduce or eliminate reflections. This is very useful when you’re trying to photograph something with wet areas that are creating lots of bright, distracting reflections. Sometimes you want those reflections (for example, when you’re photographing a sunset at the beach), but other times you don’t.

If you get a polarizer, make sure you get a “circular” one because you can turn them to adjust the strength.

2. **Ultraviolet (UV).** The ultraviolet filter blocks UV light, which can create a bluish tint in your images. They’re also often used to protect the front element of your lens, and many photographers keep a UV filter on each of their lenses at all times. I keep them on all my lenses except wide angle, because if you start stacking filters on a wide-angle lens, you’ll start getting a vignette (dark shadow areas in the corners).

3. **Neutral density (ND).** The neutral density filter is basically a dark piece of glass that reduces the amount of light entering your lens. They’re useful for when you need a slower shutter speed, like if you’re trying to make water in a scene look silky smooth as in this photo of Lake Tahoe:

![Image of Lake Tahoe with neutral density filter effect]

Neutral density filters come in a variety of different strengths: everything from 1-stop to an intense 10-stop (that you can barely see through!). Personally, I’ve found the 2-stop and 10-stop most useful.

4. **Close-up.** Close-up filters are basically like magnifying glasses that let you focus closer with your lenses. They come in a variety of different strengths, and you can stack them to make your lens focus even closer. They do negatively affect image quality a little, but if you only do macro photography once in awhile, they’re great alternatives to buying a dedicated macro lens.
Extension Tubes

An extension tube (pictured above) is a hollow tube that extends the distance between the lens and the camera's sensor. This makes the lens focus closer, which is extremely useful for close-ups. The longer the extension tube, the closer the lens can focus.

Extension tubes come in a variety of different sizes, from 12mm to 50mm, but the one around 25mm is usually the most useful. For example, if you put the 25mm extension tube on a Canon 70–200 F/4L lens, you can change the minimum focusing distance from 4.9 ft to about 4 ft (which can make a big difference in close-up photography).

Although the 25mm tube is probably the one you'll use the most, there's also a benefit to owning a set of different tube sizes. One of the great things about extension tubes is that you can stack them together to make your lens focus even closer. Ever since I got a set of these tubes, I often stack a 36mm with a 20mm to make my lenses focus extremely close. This helps me fill the frame with small subjects like these wildflowers:
Tripod Collars

A tripod collar is a collar that attaches to your lens to help balance the weight between your camera and lens when you’re using a tripod. They're usually only made for longer/heavier lenses because those lenses alter the center of gravity of your camera/lens. They’re super important if you’re using a tripod because they tremendously help stabilize your long lenses. Without them, you'll notice that your camera sinks down after you lock it in on your tripod.

Remote Shutter Release

A remote shutter release allows you to trigger the shutter button without actually touching your camera. Some camera manufacturers make a wireless remote to do this, and others just have a wired remote that you can plug into your camera. They’re useful for getting sharper images, because when you press the shutter button (even gently) it shakes the camera a little, which could result in a less sharp photo.

Microfiber Cloth

Don’t ever try to clean your lens with your T-shirt or a paper towel! Instead, use a microfiber cloth, which is a special kind of cloth designed for cleaning lenses and other sensitive glass surfaces. They’re super-soft, so they won’t scratch the surface of your lens.

Air Blaster

Another very useful cleaning accessory is an air blaster. They look like little rubber rockets, and you squeeze them to let out a burst of air that’s useful for blowing dust off your lens and/or sensor.

Things to Remember

- Polarizing filters reduce reflections and deepen the colors of the sky
- Ultraviolet (UV) filters block UV light from entering your lens, which could cast a bluish tint to your images
- Neutral density (ND) filters decrease the amount of light entering your lens, which allows you to use longer shutter speeds
- Close-up filters allow you to focus closer with your lenses but decrease image quality
- Extension tubes make your lenses focus closer and do not affect image quality
- Tripod collars help stabilize your long lenses when using a tripod
- A remote shutter release allows you to trigger the shutter button without touching your camera, which helps you get sharper images
- Microfiber cloths are great for cleaning lenses
- Air blasters are great for cleaning lenses and/or camera sensors
15 — Camera Settings

Most cameras these days have tons of features and custom settings. It’s important to read your camera’s manual to see what all these settings can do. Not all cameras are the same, and some of them offer some really unique features that you’ll only discover by reading the manual. There are some settings though that just about every camera has, and those are the ones we’ll talk about in this chapter.

Aperture, Shutter Speed, and ISO

I like to call these the “Big 3” because they play such an important role in photography. I’ve already discussed them a lot in this book, so hopefully you now have a good understanding of them and how they affect your photos. Make sure you know how to change them on your camera. They’re so important that you should know how to change them without looking.

Focusing Options

Every camera has unique focusing options, but they should all have an ability to control what point to autofocus at. Make sure you know how to do this on your camera, because you don’t want autofocus to make all the decisions for you.

Many cameras also have special focusing modes for action-type photography (e.g. wildlife). For example, Canon’s 7D has a lot of useful ways to focus in specific areas of a frame. Since each camera is unique with these modes, it’s impossible to cover them all, so make sure you read your manual to learn about them.

JPEG vs RAW

One of the biggest ongoing debates in photography these days is whether you should shoot in JPEG or RAW. Personally, I think there are advantages to both. Here’s an overview of each format:

- **RAW.** These files contain raw image data from your camera’s sensor. This raw data allows you to make a lot of adjustments in post-processing without sacrificing image quality at all. Unfortunately, they’re also very large files, and your camera probably has a limit on how many it can shoot in a burst before it needs to pause and write the images to the memory card. I think RAW is the best option when you’re photographing landscapes or expect to do a lot of post-processing on the image.

- **JPEG.** These files are compressed but are still very high quality. The problem with JPEG arises when you start doing a lot of post-processing (especially with curves or adjusting exposure in any way). There are a lot of benefits of shooting in JPEG though: the files are much smaller, and your camera can shoot much more in a burst (which is very helpful for photographing wildlife). I think JPEG is a great option any time you need to shoot a lot of images in a burst or when you don’t think you’ll be doing much post-processing.
Back-Button Autofocus

We talked about the value of back-button autofocusing in the chapter on focus, but it's worth mentioning again here as a reminder to set it up on your camera. It's usually not the default way to autofocus when you first get your camera—for some reason, camera manufacturers keep hiding this feature in the custom settings of the camera. So again, read your manual to figure out how to activate this on your camera. It's not always called “back-button autofocusing” in the manual, so just look for anything that mentions activating autofocus from another button.

Mirror Lock-up

If you're using an SLR camera, there's a mirror inside your camera that reflects light from the lens into the viewfinder so you can see through the lens. When you snap a photo, this mirror flips up, allowing the light to reach the sensor and create an image. When the mirror flips up like that, it can cause a subtle movement in the camera, so there's a setting called “mirror lock-up” that, when enabled, makes the camera pause for a short moment after the mirror is flipped up to allow any shake to fade away before the photo is taken. It's a little setting that can help you get sharper images and is worth using for things like landscapes or anytime you don't have to worry about shooting quickly.

Burst Shooting Modes

Your camera should have a way to keep shooting images while you hold down the shutter button. It's usually called something like “burst shooting” mode. By default, your camera is probably in another mode that just takes one photo even if you keep holding down the shutter. The burst mode is tremendously useful for shooting action shots because it can help you get a photo of your subject in the right pose. It's also useful when shooting handheld because it increases your chances of getting a shot when your camera was still.

Remote/Timer

In the previous chapter on accessories, I talked about using a remote shutter release. Well, on some cameras you have to enable some setting or switch to a special mode to make the remote work. If you don't have a remote and just want to keep your gear simple, then you can rely on the camera's self timer. All cameras should have a way to set a timer (usually 2 or 10 seconds) before taking a shot.

Read Your Manual For More

I've mentioned this before, but it's worth mentioning again: every camera has unique custom settings, so it's a good idea to read your manual to learn about them. One of those settings could really help you with a particular subject (e.g. continuous focus options) or they could just make the camera easier to use for you. For example, I recently discovered (by reading the manual, of course) that I can move the preview button on the back of my camera which makes it much easier to preview photos now. Little things like that you'll only discover by reading the manual.
Things to Remember

- Know how to quickly change the “Big 3” settings on your camera: aperture, shutter speed, and ISO
- Read your camera's manual to learn about its unique focusing features
- Back-button autofocusing can give you more control of autofocus
- Mirror lock-up can help you get sharper images
- Burst shooting mode is valuable for action shots or shooting handheld
- A remote shutter release or using the self timer can help you get sharper images
- Read your camera manual to learn about your camera’s unique custom settings
16 — Respecting Nature

While photographing nature, it's important to respect it and leave no trace. Leaving no trace means you leave the wilderness just as you found it (or maybe a little better by picking up any trash you find). It means the only thing you take away is photographs, and the only thing you leave behind is footprints. But you should also be careful just where you leave those footprints.

To ensure you leave no trace, here are a few guidelines to follow when you're out on a trail:

1. **Be careful where you step.** Avoid stepping on plants (especially wildflowers), and stay on established trails as much as possible. No photo is worth the price of another living thing. If you do venture off-trail, stay on stable surfaces like gravel or rocks.

2. **Clean your shoes and backpack before and after a hike.** More and more invasive species are entering our wilderness, so to prevent them from spreading even more, make sure you clean your shoes and backpack before and after a hike. Seeds can get stuck in the smallest crevices, so look carefully.

3. **Read the signs posted at the trailhead.** At some of the more popular trailheads, there's usually a big sign that has posted regulations, safety reminders, and special considerations for leaving no trace. Make sure you read and follow any rules specific to that trail.

4. **Don’t feed wild animals.** When you feed wild animals, it not only ruins the wildness of the land, but it also makes the animal start depending on human food. Then when a human doesn’t give it food, it’s more likely to get violent and hurt someone. Feeding wild animals is never a good idea, even if it does help you “get the shot.”

5. **Pack out all trash.** Whatever you bring in you should also bring out. This includes things like toilet paper and anything else that’s “bio-degradable.”

6. **Only clear dead vegetation, and learn how to recognize “dead” stuff.** When you're composing a photograph, you’re bound to find distracting objects in your scene and then be tempted to remove them. But only remove the stuff that you're certain is dead. And learn to recognize what’s dead, because in harsh environments like the desert, a lot of healthy, living plants look dead.

7. **Be careful as you move around your subject and set up your tripod.** When you’re exploring a composition for your subject, it’s easy to focus entirely on the subject and forget about your surroundings. So remember to always watch where you’re walking. This is important for leaving no trace and for your safety (you don’t want to walk into a cactus, it hurts!).

8. **Be respectful of wildlife (especially endangered species).** Every calorie for a wild animal is precious. They spend their entire day looking for food and a mate, so when you scare them away, they burn some of those precious calories. Avoid chasing wildlife, and instead let them come to you.
9. **Learn the local ecology before visiting someplace new.** Perhaps the best way to ensure you leave no trace is to learn the local ecology of an area before you venture there. This will help you understand what's endangered, what's invasive, and how careful you need to be while you’re hiking through that area.

Some of these guidelines might seem like a little too much, and following them might mean you only come back with one good photo per day, but with such little wilderness left on the planet and more of it being destroyed each day, it’s important for us to protect the wildness of the land that’s left.

Leaving the wilderness just as you found it will also ensure that the next visitor enjoys that same wildness you did, and hopefully your photos will inspire them to take care of it just like you did.
I think one of the best ways to learn is by example, because it helps you see how concepts apply to real situations. So that’s how we’ll end this book. On the following pages, I’ll walk through eight photos, explaining all the settings I used, the gear I used, and the compositional choices I made. Hopefully these examples will help “lock in” all the concepts from this book.

Sunset in the Mojave Desert

I was drawn to this scene because of the intense colors in the sky and how that amazing light made the brown mountains look purple and gave the creosote in the foreground a yellowish tint. I knew right away I wanted most of the frame to include the sky, since that was the main subject. I used the “rule of thirds” and placed the horizon/mountains in the bottom third of the frame. I also purposely put the tallest part of the mountain in the left third of the frame, again following the rule of thirds. Since this was a distant landscape (I think I was about 3–4 miles away from those mountains), I needed a telephoto lens to capture this scene. The focal length listed above is 67mm, but with the cropped sensor of the camera I used, it’s about the same field of view as a 140mm lens on an SLR. It might seem like I used a pretty small f-number (f/8), but since everything in the image was so far away, it still made the entire scene in sharp focus. Although I used ISO 200, I should’ve tried 400 or 800 because I didn’t use a tripod for this shot. I did rest my elbows on a rock though to help me stabilize the camera.
Costa’s Hummingbird

I was hiking one of my favorite trails one summer afternoon and about to cross a stream when I saw this Costa’s hummingbird dipping down to the stream for a drink. So I immediately stopped and started watching him. It had a regular pattern: it would go take a sip from the stream and then land on one of three branches. Two of those branches had great backgrounds (far away and contrasted well with the hummingbird), so I decided to wait there for awhile and see if I could get any photos. Since hummingbirds don’t stay perched for very long, I knew I needed a fast shutter and I wanted an out-of-focus background, so I used a wide aperture and ISO 400 to get a fast shutter speed. I also used a long lens (with a teleconverter), because I couldn’t get very close to the bird. I also couldn’t use a tripod because these birds move so fast, so I sat in a way that allowed me to rest my elbows on my knees to provide some stabilization. After sitting there for 30 minutes or so, I finally got a few great shots, including this one.
Creosote Silhouette

<table>
<thead>
<tr>
<th>Camera</th>
<th>Canon 5D Mark II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens</td>
<td>Canon 300mm f/4L with 1.4x teleconverter</td>
</tr>
<tr>
<td>Focal Length</td>
<td>420mm</td>
</tr>
<tr>
<td>Aperture</td>
<td>f/5.6</td>
</tr>
<tr>
<td>Shutter Speed</td>
<td>1/13</td>
</tr>
<tr>
<td>ISO</td>
<td>100</td>
</tr>
</tbody>
</table>

This photo is a good lesson to never give up on a sunset. The night I shot this photo, I originally planned to photograph the moon rising over some sand dunes in the Mojave Desert. Once I got out to the sand dunes, I looked at the clouds and thought to myself, “these clouds won’t clear in time” so I just walked back to my campsite and started eating dinner. Then after I take a few bites, the sun sets and the sky explodes into an amazing display of color—maybe the most dramatic sunset I’ve ever seen. So of course I stopped eating, grabbed my camera, and literally started running around looking for a good creosote branch to photograph as a silhouette. It wasn’t easy finding a branch that went straight up like this and was separated from the rest of the branches. I finally found one though and set up my camera and tripod. I used a wide aperture to help make the background out of focus. I was using a tripod, and there wasn’t much wind, so I was able to use a pretty slow shutter speed of 1/13. I should have used ISO 400 to help me get a little faster shutter speed, but luckily the image is still sharp. I also took a lot of shots until the color disappeared from the sky. The thing about sunrise and sunset is you never know exactly when the best colors will come out, so it’s a good idea to take a lot of shots and then review them later.
Providence Mountains at Sunset

<table>
<thead>
<tr>
<th>Camera</th>
<th>Canon 5D Mark II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens</td>
<td>Canon 70–200mm f/4L IS</td>
</tr>
<tr>
<td>Focal Length</td>
<td>81mm</td>
</tr>
<tr>
<td>Aperture</td>
<td>f/16</td>
</tr>
<tr>
<td>Shutter Speed</td>
<td>1 sec</td>
</tr>
<tr>
<td>ISO</td>
<td>100</td>
</tr>
</tbody>
</table>

This is one of my favorite lighting conditions: when the warm light from sunrise or sunset shines on a distant landscape that has dark clouds in the sky. I think this image would’ve been better if there were more dark clouds in the sky, but it was still a pretty beautiful scene. I wanted to show some depth leading up to those mountains to make the landscape look bigger, so I shot this photo from a small hill (I was about 4 ft above the landscape). I waited patiently until the light was only shining on the mountains, which helps make them stand out more. This image also follows color theory by using warm-cold contrast (the sky is a very cold color that contrasts well with the warm color of the mountains). Since the mountains were so far away (maybe 4 miles?), I used a telephoto lens to get the narrow field of view. I used a small aperture of f/16 because the creosote bushes in the foreground were relatively close (about 20 ft), and I wanted everything in focus. The small aperture and low light required a long shutter speed of 1 second, but I used a tripod to keep the camera still.
Painted Lady Butterfly on a Desert Sunflower

<table>
<thead>
<tr>
<th>Camera</th>
<th>Canon 5D Mark II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens</td>
<td>Canon 300mm f/4L with 1.4x teleconverter</td>
</tr>
<tr>
<td>Focal Length</td>
<td>420mm</td>
</tr>
<tr>
<td>Aperture</td>
<td>f/8</td>
</tr>
<tr>
<td>Shutter Speed</td>
<td>1/1000</td>
</tr>
<tr>
<td>ISO</td>
<td>400</td>
</tr>
</tbody>
</table>

Photographing butterflies is a combination of luck and patience. In order to get this photo, I sat down near a large group of desert sunflowers and made sure a lot of the flowers had good backgrounds in case a butterfly landed on it. Then I just waited until a butterfly landed on one of those flowers with the good backgrounds. I think it took about 30 minutes of waiting. There were a lot of painted lady butterflies flying around that day, so I didn’t have to wait too long. Once the butterfly landed, I waited until its wings were parallel to my camera’s sensor in order to maximize sharpness. I used an aperture of f/8 because I needed some depth of field in the body of the butterfly, and the background was really far away so I was able to get away with a medium f-number. Since butterflies are constantly moving, I wanted a fast shutter speed, so I used ISO 400. I used a tripod for this shot, but I kept the ballhead loose—basically I just used the tripod legs for a little bit of support. I like using the tripod this way when photographing butterflies or other insects because it allows you to quickly move the camera around while also having some support.
Before I decided to photograph this particular Joshua tree, I walked around for about an hour looking for the perfect tree. Joshua trees come in all shapes and sizes, so the search wasn’t easy. I knew I wanted a fairly simple-looking tree, so that helped narrow the search. But another thing that was important was to find a tree that didn’t have a bunch of other trees in the background that crept up into the sky. I wanted minimal distractions in the background. I decided to use a wide-angle lens because I wanted to show a lot of depth to the landscape and I wanted to communicate a sense of closeness to the Joshua tree. So I used my 17–40mm lens and got super close to the Joshua tree for this shot (I was probably about three or four feet away). If I had photographed this tree from farther away (and zoomed in with a telephoto lens), the tree wouldn’t have felt as close—it would have felt compressed. Neither feeling is necessarily right or wrong; it just depends on what you’re trying to communicate with the photo. I chose to use a small aperture of f/16 to ensure that everything was in sharp focus. I had the camera mounted on a really strong tripod and head, so I wasn’t worried about long shutter speeds.
Sunset in the Pines

<table>
<thead>
<tr>
<th>Camera</th>
<th>iPhone 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal Length</td>
<td>4.2mm</td>
</tr>
<tr>
<td>Aperture</td>
<td>f/2.2</td>
</tr>
<tr>
<td>Shutter Speed</td>
<td>1/120</td>
</tr>
<tr>
<td>ISO</td>
<td>32</td>
</tr>
</tbody>
</table>

I shot this photo with an iPhone, which is a fully automatic camera, so it's not really the subject of this book, but I'm including this image here as an example that good photos can be captured with any camera. A camera with full control (such as an SLR) does give you more creative control though. The thing that drew me to this scene the most was the light and how it shined through the pine trees and gave them this glistening look. And then I noticed the warm light was shining on the side of that pine tree on the right, and I loved the texture of that tree, so I knew I had to capture this scene. I think another thing that makes this a pleasing image is the warm/cold contrast between the blues/greens and reds/browns. The camera settings for this image might look a little weird (e.g. f/2.2, 4.2mm focal length, ISO 32), but that's because of the small sensor of the iPhone. If I had shot this image with an SLR (which has a much larger sensor), I would've used a wide-angle lens (around 28mm) and a small aperture because that tree on the right was very close to my camera.
Super Moon at Sunrise

I planned on photographing this super moon weeks in advance and knew that I wanted to photograph it with a clear sky. Shots with clouds covering the moon can be interesting, but I prefer a “raw-looking” moon. In order to ensure clear skies, I decided to hike up to one of my favorite mountain peaks in southern California. At about 9,000 ft elevation, it’s a great place to have a clear view of the horizon. I really wanted to photograph the moon at sunrise or sunset so the image would have some powerful colors. This particular image was shot at sunrise, but it was actually shot while facing west. Remember that the sun rises in the east, so I was facing the opposite direction of where the sun was rising (and where the powerful colors usually occur). When the sky is extremely clear (as it was on this day), you’ll usually see this amazing pink/blue color in the sky in the opposite direction of where the sun is rising or setting. The blue part is actually the earth’s shadow. The moon appears yellow because it’s so low on the horizon. Aside from the crystal-clear skies, there was another benefit of shooting this image at a high elevation: plenty of wind-sculpted pine trees hanging around. I picked this specific tree because of its wonderful balance and also because it had a perfect spot to put the moon. Since the moon was so bright and everything else was so dark, I had to take two exposures for this shot: one shot for the moon and another shot for the tree and sky. I combined these exposures later in post-processing. I didn’t bring a tripod, so it was really important to use a fast shutter speed to ensure I got a sharp image—so I used a wide aperture of f/5. A wide aperture like this would normally create a problem for images like this because it’d be hard to get both the moon and the tree in sharp focus. But since I had to take two exposures anyway (to account for the strong dynamic range of the scene), I also changed the focus for each shot (one focused on the moon and the other focused on the tree).
18 — Where to Go from Here

Congratulations, you've just completed an introduction to the wonderful world of nature photography! But your journey has just begun, because there's always more to learn about taking photos. Here are a few books and websites I recommend for learning more:

**Books**

- *The Camera* by Ansel Adams
- *The Negative* by Ansel Adams
- *Inner Game of Outdoor Photography* by Galen Rowell
- *The Photographer's Eye* by Michael Freeman
- *Within the Frame* by David duChemin
- *Photographically Speaking* by David duChemin

**Websites**

- Photonaturalist — photonaturalist.com
- Digital Photography School — digital-photography-school.com
- Picture Correct — picturecorrect.com
- David duChemin’s blog — davidduchemin.com
- Craft & Vision — craftandvision.com

**Thanks for Reading!**

I hope you enjoyed this book and now have a better understanding of how the camera works and how to use it to capture the magic of nature. If anything was unclear or you have a question or comment, please e-mail me at steve@photonaturalist.com — thanks!
About the Author

Steve Berardi is a nature photographer, software engineer, and founder of PhotoNaturalist—a blog on nature photography with over 16,000 subscribed readers. You can usually find him hiking in the beautiful mountains and deserts of southern California. His photos have been used by Nature Photographer Magazine, the Sierra Club, and the National Wildlife Federation. He's also written numerous articles for PhotoYou Magazine and the Digital Photography School.

More books by Steve Berardi:

53 Tips For Nature Photography

Examples: 23 Images

Wildflower Photography

13 Tips For Wildflower Photography
“The camera is an instrument that teaches people how to see without a camera.”

—Dorothea Lange
For more great tips on nature photography, check out the author’s website:

photonaturalist.com

*New articles are published every week!*