
Guide to Filters
and when to use them!
FocusEd Camera™

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Introduction

In the world of photography, there are many tools and accessories that can elevate your images to new heights. Among the essentials in a photographer's arsenal are filters, which can be a game-changer for your photos. Filters allow a photographer to manipulate light and play a crucial role in enhancing the visual impact of your shots. Understanding the different types of filters and how they can enhance your work is essential.

In this e-book, we'll explore three common types of filters: UV filters, CPL filters, and ND filters. Each of these filters serves a specific purpose and can greatly influence the quality and creativity of your photographs. We'll delve into what they are, how they work, their unique features and applications, and the ways in which they can transform your images, along with the disadvantages of using each.

UV Filters

What is a UV filter? Do you need a UV filter? What does a UV filter do?

In this e-book, we will answer all of these questions and more. We will discuss UV filters, what they do, and instances where a UV filter can be beneficial for photographers. If you'd rather watch our video covering the same information, check it out here on our YouTube channel.

First, let me explain what UV is and the differences between UV filters and other filters referred to as haze filters, clear filters, and skylight filters. UV light is a type of electromagnetic radiation and it is responsible for your tan (or burn) and appears to our eyes as a hazy sky. We cannot actually see UV light. It is out of the spectrum of visible light; however, UV light waves have a wavelength close to the size of air molecules so when UV light waves come through our atmosphere they “scatter” (the technical term is Rayleigh scatter).

This scattering is responsible for the blue color of the sky and the haze we see when we view a large volume of air like the wide open skies in a landscape. If you want to get more technical than this, there are many great scientific articles online that will give you all the details. For our purposes, you simply need to know that UV light shows up as hazy skies to our eyes.

A UV filter is used to block or minimize the UV light reaching your camera's film or sensor thereby reducing the haze seen in a photo. Sometimes you will see them referred to as haze filters or UV haze filters, but they are not exactly the same thing. A UV filter may be clear (usually a protective UV), or in the case of stronger UV coatings may have a warm or amber tint. A haze filter may also have a colored tint to it. A haze filter will block or minimize the haze just like a UV filter. Another similar filter is a skylight filter. A skylight filter is a UV filter with a slight magenta color (or orange-pink) to warm up the sky and remove some of the blue. It will also block or minimize haze. A clear filter is simply a clear filter. It should have no color cast and in many cases will still block some of the UV light (but not always). A UV filter would theoretically do a better job of blocking UV than a clear filter. UV filters will often have a combination of letters or numbers that indicate the amount of UV blocking. At the bottom of this section is a table with some common designations and filter levels. Keep in mind that in the industry there is no universally agreed upon use of these letters and numbers so any manufacturer may use any designation they choose at any time.

UV filters (and the others mentioned here) were very useful back in the days of color film photography, especially in bright light and for landscape photography. Film was strongly affected by UV light and when taking landscape photos you exposed the film to lots of UV light waves. If a UV filter was not used, photographs had more haze and a stronger blue tint throughout.

When a filter was used, it cut down on the UV hitting the film and reduced the hazy, overly blue tint of a landscape photo. Filters were also used to adjust white balance before digital white balance. Some of the filters mentioned above included a warm tint to help cancel out unwanted colors, in particular the excess blue in large expanses of sky.

In today's digital cameras these filters will have little (if any) effect. Modern cameras have coatings or additional blocking on the sensor to exclude UV light and most cameras have a digital white balance function. In fact, today's cameras are so good that not only will a UV filter do little to improve a photo, it might actually reduce quality.

This is where the debate begins! Should you use a UV filter or not? Why would you even want one if it won't improve a photo? Legions of photographers are lined up on both sides of this argument and it is a Hatfield-McCoy type argument that will probably never be resolved.

Let's address the pros of a UV filter and why you might want to use one.

Despite the fact that most cameras now have UV blocking on the sensor, UV light has different wavelengths, just like visible light, and some of those wavelengths may not be fully blocked from reaching the sensor. It is possible the haze reduction could be enhanced by a high-end UV filter. The highest quality UV filters will give you statistics about the range of wavelengths and percent of light blocked. If you are a pro landscape photographer and do the research, there may be a filter that could improve upon the results with your given camera (depending on the quality and level of UV blocking in the specific camera you own).

Below is a set of two images. The first, on the left, is the view without a UV filter. The second image is with a UV filter. I see no obvious improvement in terms of color or haziness with the filter in place. The color of the sky and trees seems unchanged, which is good. You don't want a UV filter to create a color cast. However, I do not see anything more clearly and it does not look more or less hazy in either photo.

A UV filter can be used to weather seal the front end of your lens and make it easier to clean. There are some unique circumstances where this “sealing” effect would be beneficial.

If you spend large amounts of time photographing the ocean, ocean spray, and ocean waves, or do beach portrait photography, then a UV filter could protect the end of your lens from sand and water. If the salty sea spray or something oily gets on the end of the lens, a filter is easier to clean and your lens won’t be damaged over time from repeated cleanings.

Repetitive and excessive cleaning of your lens can wear off special coatings over time as well as create a slow accumulation of micro scratches. If these happen to the lens, it could reduce image quality. If this happens to a filter, you can toss the filter and buy a new one.

Another reason many photographers choose to use a UV filter is to protect the lens from scratches or chips and breakage. By placing a UV filter on the end of the lens you would be providing an extra layer or barrier between the lens and the world.
I place UV or clear filters on the end of lenses I use with my students. I once witnessed the filter save a lens when a student tripped and fell with the camera.

The filter took the brunt of the hit and broke, but the lens and camera were fine. For my purposes, it offers some peace of mind. It also means I don't have to supply the cameras with lens caps that ultimately get lost or misplaced. The filter acts like a lens cap instead.

So as you have learned, two of the three reasons for having a UV filter actually have nothing to do with UV filtering at all. In addition, if you work in a studio nearly 100% of the time, then you would never need one for UV light or for walk-around protection.

Why are some photographers so adamantly opposed to the use of UV filters then? If you want to use it for protecting your lens, then why not just do so?

Those in the anti-UV filter camp strongly believe that the added piece of glass means poorer image quality. Theoretically, the more glass elements, the less clear the image should be. Each piece of glass lets light in, but not at 100%. Some of the light is bounced back and not always directly away. When light bounces around in the lens or between glass elements it can result in ghosting or lens flares (see image below). A lens is a scientifically developed optical system with all of the elements designed to work together for sharpness and color accuracy in photographic images. If you add a filter, especially one with poor optical characteristics, then your lens may not be able to perform at its best and you end up with compromised image quality.

If you select and use a pro-quality UV filter that has been engineered to reduce defects, distortion, or aberration, then theoretically any loss of color, quality, or sharpness would be at such a pixel level it would be almost impossible to tell when viewing photos at their full size. However, what is often the case, is that filters (even expensive ones) are not manufactured to the specifications that would make them truly flat or of an optical grade (variation of a few hundred nanometers or less). Instead many filters are only flat to a deviance of about 2000 nanometers. That is significantly “wavy” by optical standards and this results in distortion as light passes through. The waviness you might observe will likely be greater and greater with cheaper and cheaper filters (although I am sure there are exceptions). The filters that are supplied with camera kits usually fall into the cheapest of specimens and should never, I repeat never, be used if you are serious about image quality.

I believe that for your average hobby photographer, a moderately priced UV filter will not ruin your image quality in a discernible way. Your camera lenses already have between nine and fifteen glass elements on average. Adding one more layer of UV filter glass is not going to ruin birthday party photos or your weekend photo walk pictures. That being said, you still do not want to use the ones that come with a camera kit. At the end of this section, we will give you some buying tips.

The strongest argument by far against the use of UV filters is the issue of flares. In certain situations (usually bright lighting and with no lens hood in place or at night like the example below) and at certain angles you might experience ghosting or flares in your images. Having a multi-coated filter may prevent some flaring, but it can still happen. These aberrations show up as streaks or orbs of light that many photographers find undesirable; however, some photographers like having lens flares as part of their creative aesthetic. Be aware that these kinds of light effects can happen with any lens even when you are not using filters, especially if you are shooting directly toward a bright light.

There are workarounds to the problems UV filters can cause. As I said before, get a good quality UV filter and get one that has multi-coating. That will prevent some of the quality issues. Additionally, using a lens hood can block some of the light angles that will cause flares and other aberrations. The lens hood is another layer of protection for the end of your lens as well. When using filters, choose the right filter for the job and as a general rule never stack filters (although with advanced use there are times you will need to stack them). Stacking filters can compound the issue of more glass/less quality and more bouncing light rays/more flares. For each scene you photograph you should determine whether the filter(s) will be a benefit or not. For example, a UV filter won't help at all if you are taking a close-up of a flower or working in a studio setting, but a stronger UV filter might benefit a landscape photo. You can leave the UV filter on as you walk and move around. Once you get set up for the shot, you can remove the filter when you don't need it. Then replace the filter before you move to a new location.

If you decide you want to purchase a UV filter, here are a few buying tips. UV filters are available in a circular screw-on version that goes on the end of your lens. These are mainly the types I am referring to when discussing filters in this article. There are also filter holders that will hold filters of different types. The holder is added to the end of the lens or between the camera body and the lens. Filters can then be dropped in or removed as needed. These filters may still be round, or they may be square or rectangular (see image).

Most of the drawbacks to using UV filters will apply to filters/filter holders, but some of the benefits, such as lens weather sealing, may not apply.

Guide to Filters

When purchasing the circular screw-on type of filter you will need your lens size. Each lens in your collection may require a different size. For example, my 50mm lens requires a 49mm threaded screw-on filter while my 17-40mm requires a 77mm size. The lens filter size can be found on the end of the lens or on the lens cap cover, usually marked with the Greek letter Phi which looks like the letter O or zero with a slash through it. The symbol is then followed by the filter size number (and sometimes followed by mm). Do not confuse the lens filter size with the lens focal length which is often also on the front face of the lens on the rim around the glass.

If you want to purchase just one UV filter to switch out between all of your lenses, then I would recommend you purchase the largest size UV filter and a set of step-down rings (see image) so you can size it to other lenses.

Lastly, get a good quality filter with high-quality optics made of real glass or resin. You will need to do your research into the chemical composition of the glass and how it was made. Thinner glass is better than thicker glass. Impurities in the glass will affect image quality. For example, glass with a higher iron content may have a green tint, whereas “water white” glass has less iron and is more optically pure (better light transmission and no tint). “Schott” glass is a fine optical glass, like the glass used for Zeiss lenses, so filters made with it will be better but also more expensive. Purchase a filter with multi-coatings that have been shown to reduce flares and give optimal colors. Do not get polyester or plastic filters.

The outer retaining ring should consist of metal including the threads. An outer retaining ring of aluminum is cheaper and more likely to dent, therefore brass retaining rings are preferable, but they are more expensive. Do not get filters with plastic rings.

Keep in mind that many manufacturers use “pro” in their item names and there is no set standard for the use of that term. The filter may be pro level or it may not be. Also, be aware that Amazon and eBay are flooded with knockoff filters, so even if you think you are buying a name brand you may get a fake. I recommend you purchase directly from the manufacturer or one of their authorized sellers to make sure you get the real deal. In the photos below, a sign that the one on the left is a fake is the uneven font compared to the real brand item on the right with nice even text. This is just one possible way to detect a fake filter.

So what's the takeaway?

Whether you choose to use a UV filter is mostly a matter of personal choice and how you weigh the pros and cons of their use. There are really no right or wrong answers (although die-hard believers on one side of the debate or the other might disagree). I personally use a protective UV on my lenses and remove it when it might cause an issue. If you'd like help choosing a quality UV filter, we can assist you. Just get in touch with us on social media or at our website and we are happy to assist you.

SAMPLE UV FILTER DESIGNATIONS*	WHAT IT DOES
UV Protective Filter	Blocks low-level UV light
Haze 1, UV 1A[1], UV-010, UV(0)[2]	Blocks about 70% of the UV spectrum
UV-15	Blocks about 81% of the UV spectrum
UV-16	Block approximately 89% of UV
UV-17	Blocks approximately 97% of UV
Haze 2, 2A	Blocks approximately 100% of UV
UV2, UV-415, UV2A, UV2B	Optimized for water, snow, high altitude where UV is magnified; Blocks up to 100% of UV radiation
UV-420	Blocks 100% and some of the visible spectrum resulting in an overall warming effect of the images
L37	Designed for the 370nm portion of the UV spectrum
L39	Designed for the 390nm portion of the UV spectrum; warm orange/yellow tint; recommended for B&W
Skylight 1A	Lighter toned (usually more pink tint[3] than the amber of UV, preferred for portraits); also cuts through UV haze
Skylight 1B	Darker toned version of the 1A

*This is just a sample of possible letter and number designations; there are many others.

[1]The letters A, B, and C indicate the region of the UV spectrum that is blocked. Ultraviolet C is farthest away from visible light and has little effect on digital photography. Ultraviolet A and B refer to regions closer to visible light, with A begin the closest. A UV(C) filter will block UVC light. A UV(B) will block B and C. A UV(A) filter will block A, B, and C.

[2]The number 0 means zero or an insignificant amount of UV should pass through or that it blocks approximately 100% of all UV (A, B, and C).

[3]Color tints vary between manufacturers and models of UV, Skylight, and other filters. Never assume amber is always UV and pink is always Skylight.

Polarizing or CPL Filters

Have you ever noticed how wearing sunglasses reduces glare and eye strain? Or noticed that the world looks a little better – bluer skies, deeper color – when you have them on?

A polarizer filter is like sunglasses for your camera lens. The reduction of reflections, increased saturation, and enhanced look to foliage and clouds make polarizers one of the must-have filters for landscape photography. It is also great for portraits and other genres of photography, but can be tricky to use.

What is a Polarizing or CPL Filter?

A polarizing filter or circular polarizing filter (CPL) is added to a lens to filter out certain light waves preventing them from entering the camera, or conversely to allow only certain light waves into the camera. The filter rotates to increase or decrease the effect. Their purpose is to filter light that has become polarized due to reflection from a non-metallic surface. When a beam of light from the sun hits a non-metallic surface (like glass, water, leaves, etc.) some light is refracted and some light is reflected. When the angle between the refracted and reflected light is perpendicular (90 degrees – this 90-degree angle is important, we will come back to this later), you create a reflection that is polarized light. Polarized light has its wave or vibration reduced to one plane (light waves normally vibrate in more than one plane). Polarized light from horizontal surfaces, such as off the hood of a car, can be blocked by wearing polarized sunglasses (they contain vertical fence-like structures in the lens that block the horizontal rays and only let in the vertical ones thus reducing the glare we see). A polarizing lens for your camera has the same effect. The filter will reduce glare and reflections from subjects like glass or water, reduce some haze (polarized light from molecules in the air), and thus help improve the overall image.

What does a polarizing filter do?

First of all the effect of a polarizing filter is not something you can replicate in editing software. You cannot simulate the effect in editing. You cannot change water to be able to see through it with editing tools or sliders. You cannot remove unwanted hot spots from glare and strong reflections. This is one element that needs to be done correctly when you take the shot, or “in camera.”

Polarizing filters are very popular among landscape photographers. Since they block some light from reaching the sensor, they can be used to enhance clouds and create more interesting skies. The polarizer can be adjusted by rotating to increase or decrease the intensity of the effect. Landscapes can appear desaturated in harsh lighting (increased highlights and reduced color and detail). The polarizer will help create more saturated colors with bluer skies and whiter clouds. The glare on foliage and plants and be eliminated or lessened by using a polarizing filter.

The glare on water (lakes, ponds, waterfalls) can be decreased. As you rotate the filter you can see more into and through the body of water. In this image, the polarizer was rotated to increase reflections. In the image on the next page, the polarizer was rotated to decrease reflections.

Polarizers can be effective in reducing glare for portraits, as well as eliminating reflections on windows allowing you to shoot through the window (increased effect) or shoot the reflection on the window (decreased effect).

In a nutshell, if you want to achieve stunning landscape photos you will need a circular polarizer in your bag and you will need to learn when and how to use it. Below is an example of how effective a polarizer filter is when used properly. The first image is a pond with no polarizer. The second image is the same shot with the filter added to the lens. While the reflections are not completely removed, they are far less noticeable in the second image.

How do you use a polarizing filter?

The easiest way to use a polarizing filter is to put it on the lens and then rotate the filter until the scene looks best. While this can be effective, a bit more knowledge can go a long way to improving your images.

For example, there is no one position or “setting” that you can rotate the polarizer to and have that be effective for every shot. It must be adjusted whenever you move or the location of the sun moves. If you take a shot with the camera held in portrait or vertical orientation and set the polarizer for the best effect, then later turn the camera to horizontal or landscape orientation, the polarizer will need to be adjusted.

There are many other factors that will help you get the most out of your filter, such as knowing how the time of day and angle of the sun affects its use, the direction and angle of your shoot, whether the lens is wide angle or telephoto, whether it is overcast skies or not, and more.

For example, you might put the polarizer on your lens and rotate it and nothing happens. You rotate it some more, all the way around, and nothing happens. The best place to look for changes is in the sky. There should be a noticeable color shift to a darker blue.

There are times and angles where no polarized light may be entering the camera. If no polarized light is entering, then there is nothing for the filter to block. If you rotate the filter and there is no change, then take the polarizer off. It isn't helping and it just becomes another piece of glass that could reduce your image quality.

This is where that 90-degree angle information I mentioned at the start comes in handy. Polarizing filters work best when they are at a 90-degree angle from the sun. This means a polarizer will have practically no effect when you have a photo shoot facing toward the sun. Your sunrise or sunset photos will be better without it and you also reduce the odds of flares appearing in your shots when you remove the filter.

Below is an image where the camera was aimed toward the sun. In an instance like this, a polarizing filter would have little or no effect.

To find the 90-degree angle where a polarizer is most effective, there is a “handy” little trick using your hand! Make a letter L or gun shape out of your hand (forefinger as the gun barrel and your thumb as the hammer) and point the “gun” toward the sun. Rotate with your wrist only and notice the direction your thumb points as you rotate around. Any direction that your thumb points is a direction you can point your camera with the polarizer for maximum effect.

You are essentially creating a 90-degree angle with your forefinger and thumb. You can get off angle a little and the effect will still work somewhat, but if you get too far off you won’t see much difference with the polarizer versus without.

Something else to keep in mind, maximizing the effect with your polarizer may not always be the best option. For example, if you remove all the reflection off of a body of water, then the water may appear unnatural. Since the filter tends to increase saturation, there can be too much of a good thing in your skies too. That deeper blue can begin to appear almost black and sometimes does not appear uniformly throughout the image. The wider the angle of your lens, the more you will notice the shift in color in the sky becoming unnatural.

In a case where you notice the sky getting too dark, take control over the issue and reduce the polarization by backing down and taking several shots with different levels. Keep in mind that the darkening effect is almost always more noticeable on your computer screen, than what you saw in camera. So when you think you have it right, take an image, then back down a bit and take a few more. Notice in the image on the next page how the blues become very dark near the top of the frame.

Another aspect of using a polarizer that you should be aware of is the decrease in exposure it creates. When the filter is in place, it acts like sunglasses. When you put on sunglasses, everything gets a bit darker, right? The same applies to the camera. When you add the filter, the amount of light hitting the sensor is reduced. The amount of loss of light will depend on the filter you buy, but most lose at least one stop of light (and some up to three stops). Therefore, a polarizing filter is not a good choice when you have a low-light situation. It also means you may have to open your aperture, increase your ISO, or decrease your shutter speed to get proper exposure. If you are in auto shooting modes the camera will do this automatically to compensate. A decrease in shutter speed may then require a tripod to avoid camera shake. If you are not familiar with the exposure triangle and stops of light, you might want to read some of our other e-books that cover these topics. In a pinch, a polarizer can be used as a low-level ND (neutral density) filter which will be discussed in the next section.

Vignetting is another common issue with polarizing filters. Wide apertures (which are commonly used for landscape photos) and wide-angle lenses can increase this effect. The vignette issue varies greatly among brands, so carefully read reviews. A slim or thin polarizer may help prevent the vignette on a wide-angle lens. The vignetting effect and darkening effect mentioned previously, also mean that polarizers are not a great option for a panorama. As you move across the panorama, your angle from the sun will change and the colors in the sky can look unnatural. If you plan to take a series of images that stitch together in editing, you may find it impossible to line up and match the colors of the sky from one image to the next in the sequence. In the image below the sky gets noticeably darker towards the right side of the panorama as the angle from the sun changes.

A polarizer will not alleviate the need for multiple exposures or post-processing. While a polarizer can greatly improve a landscape photo, there may be times when you still need to take an image with exposure set on the foreground and an image with exposure set on the mid- or background (or sky) which are then blended. If you are taking a photo of a waterfall, you might want the reflection on some of the rocks that are out of the water, but remove the reflections on the pools of water. You would still need to take multiple images that are later blended in editing.

While maximizing the effect of a polarizer can saturate colors in a traditional landscape photo, it does the opposite effect on a rainbow! Rainbows are caused by reflections, so if you rotate the polarizer to increase the glare (minimize the effect of the polarizer), you will see a more colorful rainbow. If you rotate to decrease the glare (maximize the effect of the polarizer), the rainbow may almost disappear from view.

One final suggestion for getting the most from your polarizer is to change the metering on your camera from matrix/evaluative to center-weighted (preferable, if it is an option) or spot metering. Then point and meter off of a mid-tone in the scene to set your exposure. Your camera manual will explain the different types of metering modes available and which shooting modes you can use with them (in most cases you cannot change the metering mode in auto shooting mode).

What should I look for when buying a circular polarizer?

Don't buy cheap. A quality filter is important. A quality filter will have the polarizing material bonded and sandwiched between layers of glass for better optical quality (no air bubbles or irregularities). The optic should be good glass (not plastic) and look for one with multi-coating. Uncoated filters can cause ghosting and flares. The retaining rings should be brass (strongest), or at the least aluminum (which can jam and dent more easily), and never plastic.

Just like with UV filters, you will need the size that fits the diameter size of your lens. You will need to purchase a filter that is the same size, or purchase an oversized filter and step-up rings so you can use the filter on all of your lenses (instead of buying a filter for every lens). For example, if you have Nikon lenses in 52mm, 72mm, and 77mm instead of buying three filters (one for each), you can purchase one filter in the 77mm size and then use the step-up rings when you need to use it with the 52m or 72mm lenses.

When doing your shopping you may encounter linear polarizing filters. Linear and circular polarizers perform almost identically. Circular polarizers are designed for use with autofocus lenses (but can be used with manual focus lenses with the same results). Linear polarizers are designed for manual-focus lenses and should not be used on autofocus lenses.

What are some recommended brands of polarizing filters?

I hesitate to recommend a specific filter because new versions of filters are constantly entering the market constantly. Remember that there are no standardized requirements to label a filter as "pro." I suggest you do your research and read lots of reviews that include tests or sample images. I would recommend you buy directly from the manufacturer or an authorized seller for that brand. I do not recommend buying on Amazon. Many photographers have complained of receiving poor-quality replicas or knockoffs of the products and there are many resellers that are not authorized distributors. Some well-known brands include B+W, Tiffen, K&F Concept, Urth, PolarPro, Hoya, FotodioX, Neewer, Kase, NiSi, and those made by Canon and Nikon.

I have used several of these brands over the years. If you are an amateur or hobbyist, then most mid-range price filters will be fine for your purposes. Do not buy the cheapest filters and don't use the freebie ones that come in camera kits; you will not be happy with the results.

The Takeaway...

If you photograph outdoors, particularly landscapes, you will want a circular polarizer. Don't leave it on the camera all the time, but definitely use it when the circumstances are right and it will improve your photography. Use it to make photos pop – bluer skies, saturated color, and less glare. While you may still have to edit in Photoshop, remember that editing programs – no matter how much "magic" they seem to be able to perform – cannot replicate the effects of a polarizer (when used correctly).

Neutral Density (ND) Filters

While ND filters are extensively used in the film industry to control exposure where shutter speeds are limited, many photographers are unsure whether they should purchase one for their camera lens.

The main function of a ND filter is to allow a photographer to use wide apertures in bright lighting conditions. In other words, an ND filter is like “sunglasses” for your lens. When you put an ND filter on your lens, the scene is not as bright. There are several scenarios where this function can be applied in photography.

What is an ND filter? How do ND filters work?

Neutral density filters are grey-toned and in theory should be neutral, meaning there is no color shift to cool or warm and no tint of green or purple. The darkened glass is designed to absorb light as it passes into the lens and onto the camera sensor. ND filters come in various strengths which are measured as stops of light ranging from ND2 (1 stop) to ND1000 (10 stops) and beyond. Each “stop” of light blocking prevents 50% (half) of the light from coming into the camera. ND filter strengths are indicated in four possible ways – ND factor, stops, ND1 numbers, or optical density. There is a chart at the bottom of this article that shows these different notations. Just be aware of how ND filtering is measured when you make a purchase to be sure you get the strength level you want.

Robert Emperley from Strasbourg, Alsace, France, CC BY-SA 2.0, via Wikimedia Commons

The photo on the previous page demonstrates the effect of a neutral density filter. Note that the photograph was exposed for the view through the filter, and thus the remainder of the scene is overexposed. If the exposure had instead been set for the unfiltered background, it would appear properly exposed while the view through the filter would be dark.

Some ND filters offer only one consistent strength level and some offer variable strengths that are adjusted by rotating the filter. Whereas a standard ND filter has an even density from edge to edge, a graduated ND filter is clear on one side and gradually builds up density (a gradient) toward the other side. Graduated ND filters are almost exclusively used by landscape photographers to even out scenes with exposure extremes, such as a bright sky with a shaded or darker valley and foreground. Graduated ND filters are typically sold as square drop-in filters so you can properly line up the horizon. Standard ND filters may be sold as square drop-in filters or circular ones that screw onto the end of your lens. A variable ND will be circular so that the two pieces of glass can be rotated to get the appropriate strength effect.

What are the main uses for ND filters?

ND filters are mainly used for portraits and landscape photography. They make it possible to use extended shutter speeds to “smooth” the look of flowing water, clouds, or traffic and blur movement. In bright lighting conditions, an ND filter (depending on the strength) allows a photographer to use fully wide-open apertures for shallow depth of field.

On the next few pages, we will look at some specific scenarios to learn how an ND filter might benefit your photography.

If you want to take long exposures during the daytime, a strong ND filter is a necessity in your camera bag. Long exposures are used to get motion blur in water, clouds, traffic, crowds of people, and more. In the example photo below, an ND filter allowed the shutter to stay open for a much longer time (long exposure) and as a result, the moving water becomes a soft, white blur. Without the ND, a long exposure would create an extremely overexposed or all-white image. When used properly, the photographer still gets the same overall brightness that they would have gotten with proper exposure without the filter. As an example, if the scene on the next page requires settings of ISO 100, f/8, and 1/500th with no filter in place, then we can adjust to a slower shutter speed and add the appropriate level of ND strength to the lens to create the same exposure and the result is the same level of overall brightness. If the shutter had to be adjusted to 2 seconds to create this amount of blur, that means we changed the shutter speed by 10 stops (1/500, 1/250, 1/125, 1/60, 1/30, 1/15, 1/8, ¼, ½, 1 second, 2 seconds). We would need a 10-stop ND filter to compensate. You can learn to do these calculations yourself, or there are apps for long exposure that can calculate for you.

An ND filter can be beneficial for portrait photographers. Typically a lower-strength ND filter would be used for portraits along with a prime lens at a wide aperture for blur or shallow depth of field. Imagine you want to shoot at f/1.2 or f/1.4 and it is very sunny outside. The aperture is wide open. You already adjusted the ISO as low as it will go (ISO 50 or 100) and you've got the fastest shutter speed you can get from your camera (1/4000 or 1/8000) and the image is still too bright. To bring down the exposure and keep the shallow depth of field, you need an ND filter for that portrait. Without an ND filter, your only option would be to close down the aperture to f/2.8 or maybe more. If your image is too bright and you want to keep your aperture wide, an ND filter can help.

Another use for ND filters and portraiture is to block light so that you can use a strobe or flash at the regular sync speed (if you don't have high-speed sync or don't want to use high-speed sync). The sync speed of a camera and flash is the maximum shutter speed where the camera's computer can match the timing of the flash with the opening of the shutter and still use the maximum power of the flash. High-speed sync will allow you to use a faster shutter, but you lose some of the strength of the flash. Therefore, if you want to use the full power of your flash, for example during outdoor portraits on a sunny day, the normal synced shutter speed may be too slow and result in overexposure by letting in too much light. Adding an ND filter to your lens can correct the exposure.

The final scenario we will discuss in this article is the use of a graduated ND filter for landscapes. A graduated filter is darker at the top, gets lighter in the middle, and is clear at the bottom. If you need to take a photo of a landscape that has a dark foreground, but the sky is bright, then you position the center of the filter over the horizon line (where the dark filtering is fading). This will even out the exposure. It is not a magic fix-all, but it will keep the sky from being blown out or the foreground from looking like a silhouette, and it will let you get the image “in camera” instead of blending bracketed exposures in post/editing.

The filter is just subduing parts of the scene enough to even out the exposure. If you use an ND filter that is too strong, your sky might have rich colors, but then anything that crosses the horizon into the sky (such as trees) will be unnaturally dark. You don’t want an abrupt transition and you don’t want to overdo the level or strength of the ND you choose to use. You will still need to even everything out in processing.

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The photo on the previous page demonstrates a graduated ND filter. The darkening effect is only on the top half. Notice how the top half where the sky is covered has been darkened, but the lower half over the trees and water is clear and has almost the same exposure as the area of trees and water that are not under the filter.

What are the potential issues with ND filters?

As with any filter, adding additional glass elements to the lens can cause glare, ghosting, and flares. These can sometimes be removed in editing. Changing your position or using a lens hood can help eliminate these effects. Stacking an ND filter with other filters, such as a polarizer or UV filter, is not recommended because it can create more or worsen these effects. A filter with multi-coatings can help prevent these undesirable effects.

Adding an ND filter may also affect image quality because you are adding additional glass elements to the lens. In the case of a variable ND filter, you are adding two pieces of additional glass.

Another issue is vignetting (darkening in the corners). This is more likely to occur with variable ND filters or a filter with a thick ring. Slim filters lack threads on the front side, therefore the slimmer profile is less likely to create a vignette. Slim filters are a good option for wide-angle lenses and zoom lenses.

Cheaper filters may have a color shift. The quality is usually better when you spend a bit more. More expensive filters will be more neutral.

What should I look for when I buy ND filters?

The same general suggestions as made previously regarding CPL and UV filters apply to buying ND filters. Get filters with metal rings and glass, not plastic! Buy one with good glass and multi-coatings. Carefully read the reviews and look at sample images before you buy and be careful buying online. Many filters sold online are knock-offs. The best place to source your filters is directly from the manufacturer or an authorized retailer.

Variable ND filters: Advantages and Disadvantages

I have briefly mentioned variable ND filters which offer a range of ND levels instead of just one. If you purchase a variable ND, you can save some money because one filter, such as an ND 3-6 will offer many different strength levels instead of buying individual ND filters for each level of 3, 4, 5, and 6. As explained before, you can buy filters in a larger size and use step-down rings to fit them on multiple lenses instead of buying filters for each individual lens. Variable ND filters can also be helpful when the light is changing fast as they are easier to quickly adjust to keep the same level of exposure.

The main drawback to purchasing a variable ND is the dreaded “X” or cross pattern that can be created as you rotate the filters. Since the filter blocks light from certain angles using two pieces of glass, the light that is blocked isn’t always uniform. You can sometimes see artifacts, patchy or uneven cross-like patterns, or a vignette that gets worse with the higher ND filtration. To mitigate this issue, try to use the variable ND below its maximum.

The image on the previous page was taken with a K&F Concept ND2-400 Slim Variable filter set at about 8 stops. When viewed at 100% there are small artifacts visible and slight vignetting in the corners (most easily noticed in the top left corner where the sky is darker blue). This was not a high-resolution image - taken on an 8MP old Canon Rebel with a 17-40mm lens at 17mm. Using a slim filter and keeping it set below its maximum strength will help eliminate unwanted effects.

Don’t purchase a graduated ND unless you plan to take landscape photos frequently and will need to darken skies during sunrise, and sunset, or to balance out really bright skies. You don’t need a graduated ND taking up space in your bag if you only take landscape photos occasionally. The workaround is to take a bracketed exposure of three images (one photo exposed for the sky or background, one photo exposed for the mid-ground, and one photo exposed for the foreground) which you then blend in an editing program like Photoshop.

Keep in mind that there are different types of graduated ND filters, such as hard (sharp line between dark and light areas) and soft (more gradual transition). The soft graduated ND filters are often easier to use, especially for beginners, and a better option when there are objects along the horizon line (trees, buildings).

ND STOPS	ND FACTOR	OPTICAL DENSITY	ND 1 NUMBER	AMOUNT LIGHT IS REDUCED
1	2	0.3	ND 101	1/2
2	4	0.6	ND 102	1/4
3	8	0.9	ND 103	1/8
4	16	1.2	ND 104	1/16
5	32	1.5	ND 105	1/32
6	64	1.8	ND 106	1/64
7	128	2.1	ND 107	1/128
8	256	2.4	ND 108	1/256
9	512 (ND500)	2.7	ND 109	1/512
10	1024 (ND1000)	3	ND 110	1/1024

The chart above shows some of the different ways that ND filter strengths are labeled. ND Filters are available from ND1 to ND100000 and beyond. An ND100000 is the minimum strength needed for photographing the sun.

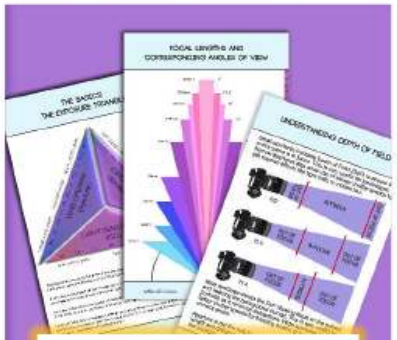
To Sum it All Up...

So, in summary, ND filters can be a good addition to the camera bag, primarily for portrait and landscape photographers. They can be a bit tricky to use, but understanding how they work and the shooting scenarios they are intended to correct will help you get better images overall.

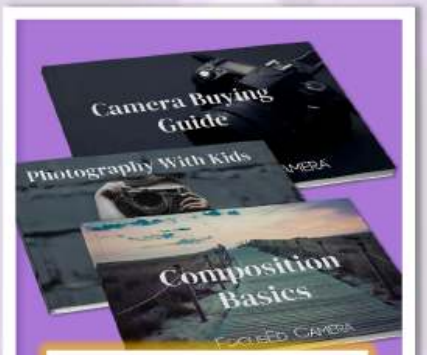
Mega Pixel our Superhero Mascot!

You finished this guide! You're awesome!

You know what else is awesome? These additional photography resources to help you along your photography journey!



Photography cheat sheets help you understand the basics



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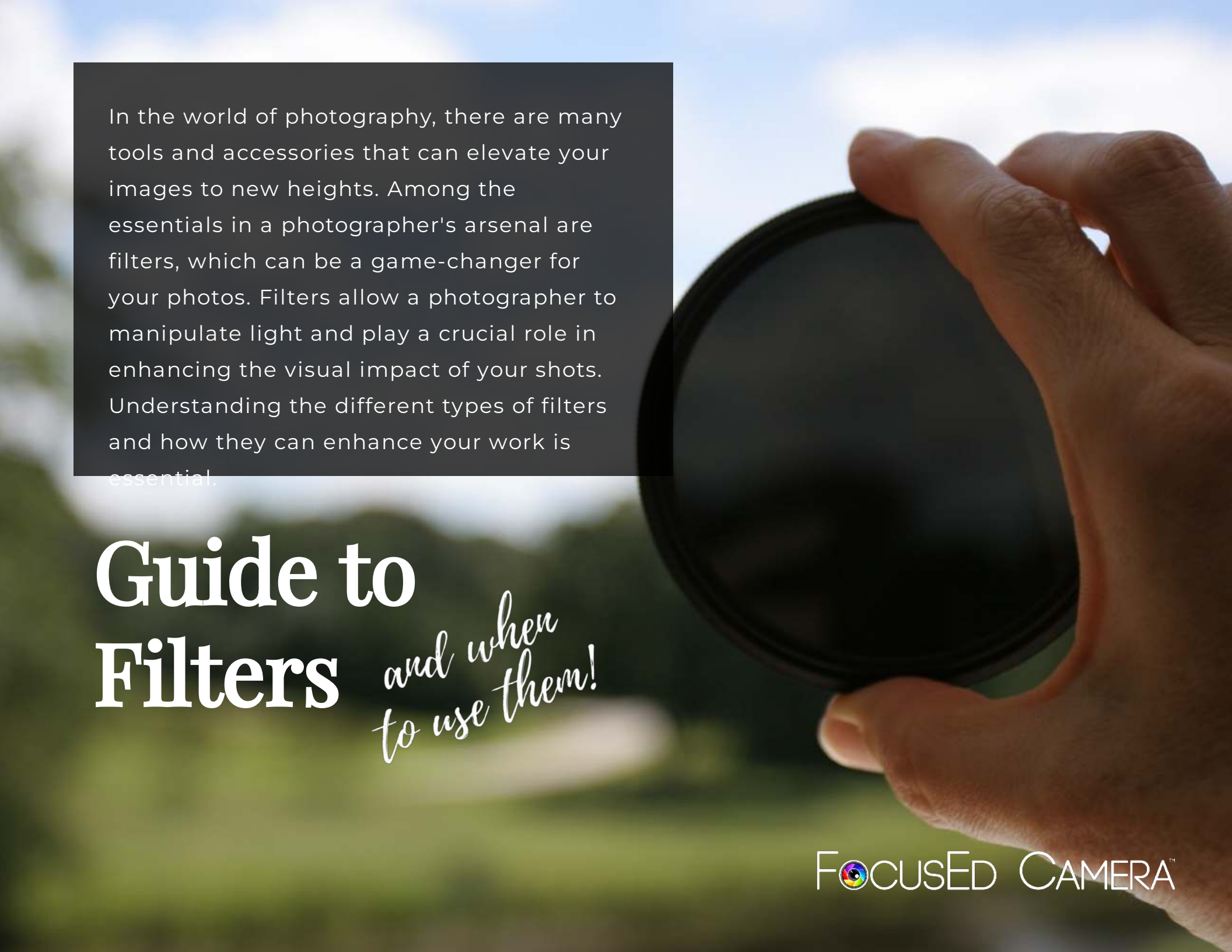
About the Author

Cheryl Ritzel, founder of FocusEd Camera, is an esteemed instructional coach. Her exceptional talents have garnered recognition and accolades throughout her career. Cheryl's company and her remarkable work have been featured in prestigious publications such as ICM Magazine, Business Insider, Dogster, Spectrum News, and Yahoo News, and on the social media channels of Lensbaby, Canon, and Adaptalux.

In the world of photography, there are many tools and accessories that can elevate your images to new heights. Among the essentials in a photographer's arsenal are filters, which can be a game-changer for your photos. Filters allow a photographer to manipulate light and play a crucial role in enhancing the visual impact of your shots. Understanding the different types of filters and how they can enhance your work is essential.

Guide to Filters

and when to use them!



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