

An Unfiltered View of Photography Filters

Robert Stone - February 2024, v 1.4

Choosing filters or filter systems frustrates every photographer! There are just too many brands, types, and options. Filters chosen by a seascape photographer will not be the same as those chosen by a mountain photographer or woodlands photographer. I'm not going to recommend any specific brand or type ... just give you a few things to think about before you lay your money down.

There are pluses and minuses to ALL the filter systems you might choose. And frankly, with new filter systems appearing every few months, you really cannot afford to 'upgrade' that frequently.

Here are the basics; the devilish details are explored later.

The Basics

You will read that there are two essential filters – polarizers and neutral density filters. This statement is a bit of a canard. All cameras are fully capable of taking pictures without filters, so filters are not truly 'essential'. But in practice, a photographer will need filters to produce images that match their creative vision. Both of these are used frequently by landscape photographers.

A polarizer has the ability to remove reflections (glare) from surfaces, especially leaves, flat water, the wet surfaces around waterfalls, and rain-soaked objects. It also darkens blue skies and removes haze. These effects are exceedingly difficult to duplicate in Photoshop. There are additional comments on polarizers at the end of this document.

Neutral density (ND) filters reduce the amount of light entering the camera. This is commonly needed to obtain longer shutter speeds to smooth waterfalls, or to avoid using ridiculously small, sharpness stealing apertures. ND filters are often used for video where shutter speeds of 1 over twice the frame-rate (e.g. 1/60 sec @ 30 fps) are sought. These filters come in a wide variety of strengths, from 1 to 10 stops, or more. There are several ways to state the strength of ND filters. An explanation is added as an appendix.

Filter Formats – Round, Rectangle or Bespoke

Round Filters

Round filters are threaded onto the front of your lens. All round filters are interchangeable. Every 77mm round filter will fit every lens that has the $\phi 77$ symbol on it.

Rectangular (Slot-In) Filters

Rectangular filters require an adapter ring that is threaded onto the front of your lens, just like round filters. The filter holder is attached/clamped to this adapter ring and the filters are dropped into the holder's slots.

Rectangular filter systems at 100mm wide will cover most lenses. There are also 66mm, 75mm, 84mm, 90mm, 130mm, and 150mm systems as well. You should check the filter sizes of your current lenses to find the largest you need, and adapter rings for the smaller sizes.

Uniformly tinted rectangular filters, NDs for example, may actually be square; it simply has to cover the lens. Gradient filters will be taller than wide so that they can be repositioned in the holder. This is described below.

Bespoke Filters

Some filters are designed for specific cameras or lenses. Many long telephoto lenses take filters in the lens itself. These are specific to the lens and lens' manufacturer. They may be glass, gel or acetate. If your telephoto uses glass filters, it is important to have the clear filter supplied with the lens in place even when no other filter is required. (Glass filters are thick enough to be part of the optical design of the lens.)

Very recently, 'internal' filters are appearing on the market. Some attach to the lens' rear mount, others are fitted inside the camera, over the sensor. As of this writing, these are all 3rd party products.

Some recent fast ultra-wide angle lenses will not accept either round or rectangular filters! Their front elements protrude so far beyond the lens body that threads are impossible. But never fear, filter manufacturers do make special devices that attach huge filters to these lenses; such highly specialized filter systems may only work on that one lens.

Filter Types – Uniform and Gradient

Uniform (or 'solid') filters are optically the same throughout; Polarizers, Neutral Density (ND), UV, Clear and Skylight filters are common examples. If you shoot B&W film, you may use uniform color filters to modify tone placement.

Round 'Variable ND' filters are now available. These allow you to 'dial in' the amount of darkness needed to achieve the shutter speed you want. These are based on the principle that two linear polarizers can be crossed at different angles to reduce the amount of light passing through.

Gradient neutral density (Grad ND) filters are clear at one end and tinted at the other with a modest transition zone in the middle. These filters aim to reduce the bright tonality of sky vs. land. This is perhaps the most important application for these rectangular filter systems.

With the dark part of the filter at the top, sliding the filters up and down in the holder allows you to align the transition area to match the horizon. This is best done with the lens stopped down to shooting aperture. Then, because the bracket can be rotated in the adapter, you can adjust the angle of the grad to any angle you wish, for example, the slope of a mountain range. One of the newest systems allows multiple Grad NDs to be rotated independently!

The ND part may provide 1, 2, 3 or more stops of light reduction. And to complicate filter selection even more, the transition zone may be 'soft', 'hard' or 'very hard' and even reversed on one side. Some systems offer color grads as well, sepia grads, sky blue grads and sunny yellow grads.

Round Grad ND filters are also available, but the transition zone is not adjustable, and always in the middle.

Filter Colors

In landscape photography, filters should be color neutral. The colors of the landscape are part of the composition and filters should not change their hue. Polarizers, UV, Clear, ND and Grad ND filters fall into this category. However, warming and cooling filters can be useful; some incorporate a polarizer as well.

Color filters have their origin in Black & White film photography. Early B&W films were 'orthochromatic', sensitive almost exclusively to blue light. Ansel Adams often used deep yellow and red filters that would darken blue skies and allow tonal separation of clouds. (Printing paper is similar to orthochromatic, allowing the use of a red 'safe light' filters in the darkroom.)

Modern panchromatic B&W films are responsive to light across the visible spectrum. However, the use of color filters is still important. Red and yellow filters darken blue sky; green filter lighten foliage and can add a nice 'tan' to Caucasian skin; blue filters lighten parts of landscape in shadow.¹

That said, you will find a staggering array of colored filters, round and rectangular, that may have creative value for your images. For film photographers, these are the most direct way to make hue changes. There are filters that will cool tungsten illumination to match sunlight and filters to warm sunlight to match tungsten illumination. Subtler

¹ Ansel Adams' books on photography are still excellent resources for photographers, both color and B&W!

color temperature changes can be made with 'MIRE'D' (Micro Reciprocal Degree) filters. Look these up in Wikipedia if you need them!

For digital photographers, many of these 'solid filter' effects can be replicated in Photoshop with an adjustment layer. An adjustment layer's variable opacity makes hue and tonal effects remarkably precise and easy.

[The Devilish Details](#)

Leaving software-based filters behind, let's look at the pros and cons of physical filters in landscape photography.

[Round Filters](#)

As mentioned, all round, threaded filters are compatible. This means you do NOT need to follow any brand loyalty, a big plus for round filters! If you find a great review of a new hydrogen alpha filter for the 2024 total solar eclipse, just get the size you need.

[Filter sets for each lens or step-up rings?](#)

My first serious camera (film) was a Nikon F. Many of the prime Nikon lenses took 52mm filters. My first set of DSLR landscape lenses all used 77mm filters! Hooray ... the filter sets needed just one filter diameter!

Today, the 'holy trinity' for my Nikon mirrorless camera is 14-30mm f/4 S, 24-70mm f/4 S, and 70-200mm f/4 G. The filter sizes are 82mm, 72mm and 67mm. Filter sets for each would be a lot of filters; costly to buy and take up a lot of room in the bag.

One often suggested approach to lens sets with multiple filter sizes is to buy one set of filters to fit the lens with largest filter diameter, then using step-up rings to attach them to the smaller lenses. Step-up rings are inexpensive, less than 10% of the cost of a good filter. So, for my system: 3 filters, 2 step-up rings; lower cost, fewer items.

[Filters vs Lens Caps & Hoods](#)

When you use step-up rings to place large filters on smaller lenses, you can no longer attach its lens hood or cap. You must remove the filter and ring to get the lens cap or hood back on.

[Thin filters](#)

Most round filters have thread on both sides so they can be stacked. But I once purchased a 'thin' ND filter for my wide angle lens when multiple filters caused vignetting. This thin filter had no threads on the front, so the thin filter had to be in front. But you could not attach the lens hood or lens cap! Geesh! The product description did not mention this problem!

[Stuck and Cross-Threaded Filters](#)

Only once have I had a round filter stuck on a lens so well that I could not remove it. I believe this was because I had firmly threaded a cold filter on a warm lens. As the filter warmed up, it became too tight to remove. There are 'filter wrenches' that can be used in this situation, but I did not own one.

When I got back home, I realized I only needed to cool down the filter to remove it. Here's how: Place a small saucer of water in the freezer. Once solidly frozen, remove and cover with a layer of plastic wrap. This will keep the lens and filter dry as you place the lens filter side down on the ice. The filter will shrink faster than the lens and be easy to remove in about one minute. These days, I never fully tighten a filter to a lens. When the threads start to tighten up, I back off a quarter of a turn.

Filters that are attached properly will go on easily. If you meet any resistance while turning the filter, stop immediately. Filters with cross-threaded or damaged threads are hard to fix and may need to be replaced.

Here's a simple trick to avoid cross-threading: position the filter on the lens and slowly turn it backward! At one point, you will feel a small 'click' as the filter's threads drop into the lens' threads. Then turn smoothly in the correct direction. Practice at home; once you get the feel for this it becomes easy.

Magnetic (Threadless) Filters

There are magnetic round filter systems available now. They have no threads. The filters attach magnetically to the adapter ring, and multiple filters are then stacked magnetically. This totally avoids issues of stuck or cross-threaded filters.

You will still need adapters and/or step-up rings to match your lenses and as before, you cannot attach the lens hood or cap. The system may include 'caps' that stack magnetically on the front or back of your filter stack. This created an 'Oreo' of stacked filters. Note that magnetic round filters do not have ND Grad options.

Variable ND Filters

Some variable ND filters are noted for a defect in image uniformity; a dark 'X' pattern appears across the image. Definitely check review sites for this issue! Since they use two linear polarizers, they suffer the same caveats of polarizers. See below ...

Future proof?

When I added the amazing Nikon 14-30 f/4 S to my kit, my biggest filter size jumped to 82mm. My existing filters and their step-up rings are no longer especially useful! I think you can see where this is going. Your largest filter size today may not be your largest filter size tomorrow. You may need to buy new filters, step-up rings, or magnetic rings for the new, larger lens diameter. So much for cost savings...

Rectangular Filters

Filters vs Lens Caps & Hoods

No need to repeat details ... these systems do not allow lens caps and hoods to be used. This is not necessarily an issue; I often simply shade the front of my lens with my hand if needed. But the whole filter system may have to be disassembled and reassembled as you move from location to location.

Vulnerability

Rectangular filters can be optical-grade plastic or various types of glass. Glass tends to break if dropped; both may easily suffer scratches. For this reason, rectangular filters usually come with a dedicated protective sleeve or holder.

Future proof?

I had a nice set of 100mm rectangular filters several years ago, when all my lenses used 77 mm filters. The filters were optical plastic and I never had issues with image quality.

Rectangular filter systems, like step-up rings, require an adapter that is threaded to the front of your lens. You will need one for each different lens filter size. This bracket may hold, depending on your system, 1, 2 or 3 rectangular filters. Brackets that hold multiple filters may be more prone to vignetting.

Some rectangular filter systems include a round circular polarizer (CP) that also fits in the bracket. This can be rotated with a small wheel on the edge of bracket. You can adjust the CP to block glare, while still allowing the Grad NDs to rotate independently.

But note the implication that a new lens may require a larger filter system; moving from a 100mm to 150mm rectangular system would require all new filters. This is similar to the step-up ring alternative above. But there is no way to 'step-up' a 100mm rectangular filter to a 120mm bracket. Your next lens may require a new filter system holder and larger filters.

Compatibility

It is not clear that all rectangular filters can be used across the many rectangular filter systems. While they may be the same width, say 100mm wide, they may have different thicknesses. Your filters may slip out if too thin or be hard to adjust if too thick. If you choose to acquire a rectangular system, it is best to acquire both filters and holder from the same manufacturer. If you can, borrow a filter from friend's set, and see if they work well in the system you're considering.

Storage

Adapter rings, a filter holder and filters are sold as a 'system', including special cases or sleeves for the filters. These may take up substantial space in the bag. But you may be able to hang them on attachment points on the outside of your bag.

In practice

Using rectangular filters near waterfalls is *very* problematic. They are especially hard to keep dry when multiple filters are mounted! Waterfalls in the Adirondack mountains never have flat horizons, so all images require either bracketing exposures for blending in Photoshop, or acceptance of some unusually dark patches in non-sky objects. Modern exposure masking in Photoshop offers substantially easier blending with no need for these filters.

Bespoke Internal Filters

Internal filters are camera specific. They fit inside the camera, over the sensor. Personally, I'm quite fanatical about avoiding sensor dust, so having to remove a lens or open up the camera body to attach or change filters just seems risky. (Though perhaps not an issue for studio work.)

The nice feature of these bespoke filters is that they work with all the lenses for your camera. So only one set of filters ... maybe the only systems that do not have the size problem!

Polarizing filters would not work in these systems, so a round or rectangular system polarizer will be needed. ND Grads are not an option.

Of course, if you have multiple camera models, numbers become an issue again.

My Choice

I have found that characterizing ND and CP filters as 'essential' is true. I have round ND and CP filters for each of my lenses. I simplify things by preparing my backpack for specific trips, often with only 2 lenses. So one ND and one CP filter for each. A three stop ND has always sufficed for waterfalls. CP filters provide about two stops of neutral density, so can be used if more density is wanted. That's not a burdensome number: 4 filters for 2 lenses (all in one ThinkTank Filter Nest Mini).

While some photographers use clear or UV filters full-time to protect their lenses, I usually do not. I have used them around waterfalls as tall drop waterfalls entrain a lot of spray in the down draft. I'm a lot more comfortable making frequent, fast wipes with a microfiber cloth on the filter vs. the lens. (These days I *always* use a CP when photographing waterfalls so no need for clear filters.)

I have stopped using rectangular filters. Once I became comfortable with exposure masking and image blending in Photoshop, I abandoned them. But if I were regularly photographing seascapes or landscapes with broad horizons, I would consider another such system.

My 77mm filters currently reside in my gear closet, waiting for any possible future lens purchase that might need that size. This may seem like a waste of money. You may update lenses and cameras every few years, but high quality filters will last a lifetime. (I have my eye on the new Nikon Z 100-400 S that takes 77mm filters!)

Many of the locations I visit require camera gear to be in my backpack. I need both hands free to climb, or use hiking poles, to get to another viewpoint. Round filters do not need to be disassembled to pack into your camera bag easily. Just leave them on the lens.

Your Choice

This is not an either-or choice. If you photograph landscapes and seascapes, having multiple filter systems might be a necessity. If changes in shooting location will not require climbing or hiking poles, you may not need to disassemble the filter system frequently. And the ND Grads of the rectangular systems can save a huge amount of post-processing work!

No matter which route you take, you should do one more thing. Search YouTube for reviews of the filters from the manufacturer you are thinking of purchasing. All manufacturers claim true color neutrality on their ND filters; from experience, I know this is not always true. Color casts sometimes become more prominent in long exposures. And be sure you are looking at their current filter sets, not an older, discontinued model.

Polarizers

I did not provide much detail about polarizers in this document. Most cameras now require 'circular polarizers' (CPs or CPOLs). The word circular here does not refer to their shape; it refers to the circular polarization of light.

Some YouTubers say that polarizing filters polarize and unpolarized light. This is not correct. They merely pass or block light naturally polarized by reflection or scattering. In addition to blocking glare, polarizers also will block rainbows, something most photographers do not expect! For the science behind polarizers, check out the Polarizers document on the Technique page of my web site [WetBootPhoto](#).

Hope this was useful! Let me know if find any spelling and grammar errors, mistakes, or have any questions.

Bob - bob@wetbootphoto.com

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One of the reasons I felt compelled to write about filters is the major increase in the number of new filter systems being 'reviewed' on YouTube. Magnetic filter systems seem all the rage, with the latest being color coded to make selection from your filter 'Oreo' easier. (A good idea actually! I wish my round filters were color coded. They're all have black rims.) Kase recently introduced a new line of magnetic filters. These introduced some small incompatibilities with previous versions, even at the same filter sizes.

The problem is that *ALL* these systems are incredibly expensive! A new lens which requires wider drop-in filters, a bigger adapter or step up rings just incurs too large a cost. Add to that the inability to use lens caps and hoods, and the need to disassemble to repack them, is just too much trouble. But if you have an easy way to sell used filters ...

Maybe the bigger problem is that the people who review these systems on YouTube get their systems for free! They suffer no financial pain whether they like the system or not. Many claim that since they were not paid, their review *must* be honest. But honestly, did they keep the filters, or return them? They may not have received money, but they did receive something of value.

These days, it costs more to return items to China than the product costs; manufacturers will not even allow them to be returned!

Neutral Density Filter Nomenclature

There are three ways to describe the strength of an ND filter:

Number of Stops

Optical Density (OD)

Exposure Time Increase (ETI).

One Stop cuts the amount of light by 1/2. Two Stops cut the amount of light by 1/4.

One Stop has an optical density of 0.3. Two Stops is an optical density of 0.6.

One Stop doubles exposure time. Two stops increase exposure 4 times.

The strength of an ND filter is usually written on its packaging and the filter itself. You will see one or more of these markings:

Stops	OD	ETI
1	0.3	2X
2	0.6	4X
3	0.9	8X
4	1.2	16X
5	1.5	32X
6	1.8	64X
7	2.1	128X
8	2.4	256X
9	2.7	512X
10	3.0	1024X

When using more than one filter to get the darkness you want, you can

- 1) ADD the number of stops, or
- 2) ADD the OD values, or
- 3) MULTIPLY their ETI values.

For example, if we have both a 3 stop ND and a 2 stop CP mounted:

$$\begin{array}{l} 3 \text{ Stop ND} \quad \textit{plus} \quad 2 \text{ Stop CP} \quad = \quad 5 \text{ Stops} \\ 0.9 \text{ OD} \quad \textit{plus} \quad 0.6 \text{ OD} \quad = \quad 1.5 \text{ OD} \\ 8X \text{ ETI} \quad \textit{times} \quad 4X \text{ ETI} \quad = \quad 32X \text{ Exposure Time Increase} \end{array}$$