



Long Exposure Photography

Getting a clear view of ND Filters

Timothy Griffin

Creative Vision

Photography Workshops

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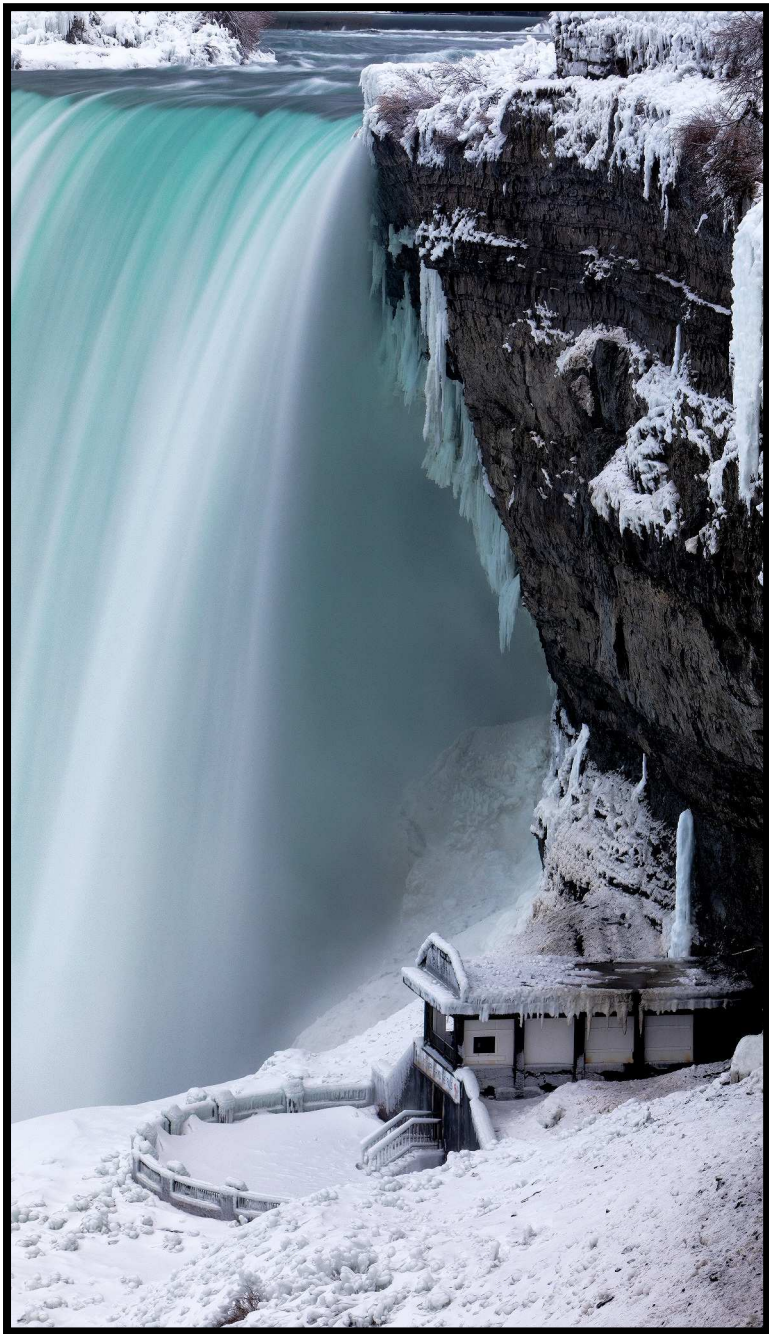
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In this Ebook, I will introduce you to a photographic technique known as Long Exposure Photography.

Long Exposure Photography is about using your cameras settings and filters to get longer exposure times then would normally be captured. Typically, your camera will select the shutter speed or aperture based on the amount of light in front of the camera. This technique is most commonly used when photographing moving water or moving clouds, but can be used for almost anything where you want to exaggerate motion by slowing down the shutter speed.

I have divided this book into 3 sections to help you get a start on Long Exposure Photography.

Equipment
Setup
Pressing the Shutter

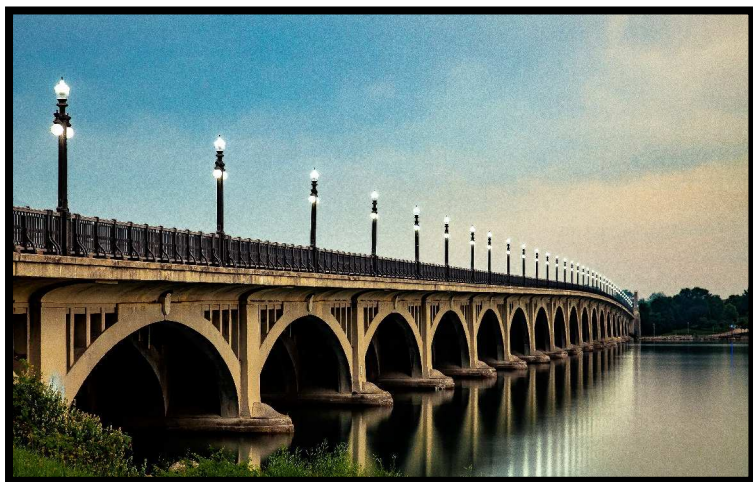
Why Long Exposure Technique?

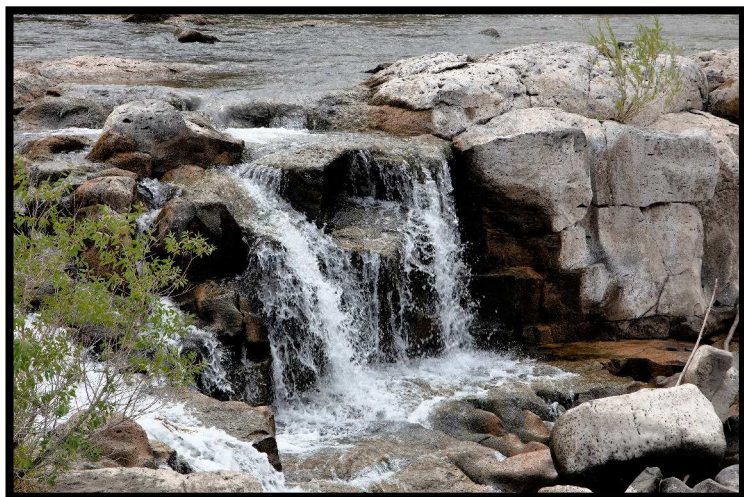
Working with the understanding that light controls everything about how our image will look, if I can control that light, I can create a specific looking image. If I am working in a studio environment, I can control all aspects of the light in my images. But, outdoors, I have minimal control over that light. I keep looking for the dimmer switch app for the sun, but haven't found it yet.

Using Neutral Density filters, I do have control on how much light reaches my sensor. Reducing light increases shutter time, this will add blur to things in motion.



When we apply this to water, the result is smoother looking water flow that tends to be much more appealing to the viewer. In the case of the current of a stream or river, it can make the surface look almost glass like.





If you look at the images to the left, you will see they are of the same waterfall.

The top image was shot at 1/250th shutter time at f11 ,ISO 200.

On the bottom image I added a 10 stop ND filter and my shutter time went to 3.2 sec at f11, ISO 200.

The smoother water flow has a more calming, soothing feel to the image shot at the longer shutter time. This is the basic effect that I look for and why I am drawn to Long Exposure Photography.

Let's get you started on this creative technique.



Equipment

The Neutral Density (ND) Filter

Long Exposure Photography starts with adding a Neutral Density filter to your camera bag. This filter, very simply will increase the time necessary to capture with ideal exposure. Simply stated, it is sunglasses for your camera.

The most common type of ND filter will attach to the front on the lens. You will have to determine the correct filter size for that lens.

Look at the lens for a number followed by the symbol Ø. This is the filter size for your lens. Common filter sizes are 58mm, 65mm, 72mm and 77mm. Your lens could be bigger or smaller from these.

Screw on filter suppliers

Breakthrough Photography

Hoya

Tiffen

B+W

Singh Ray

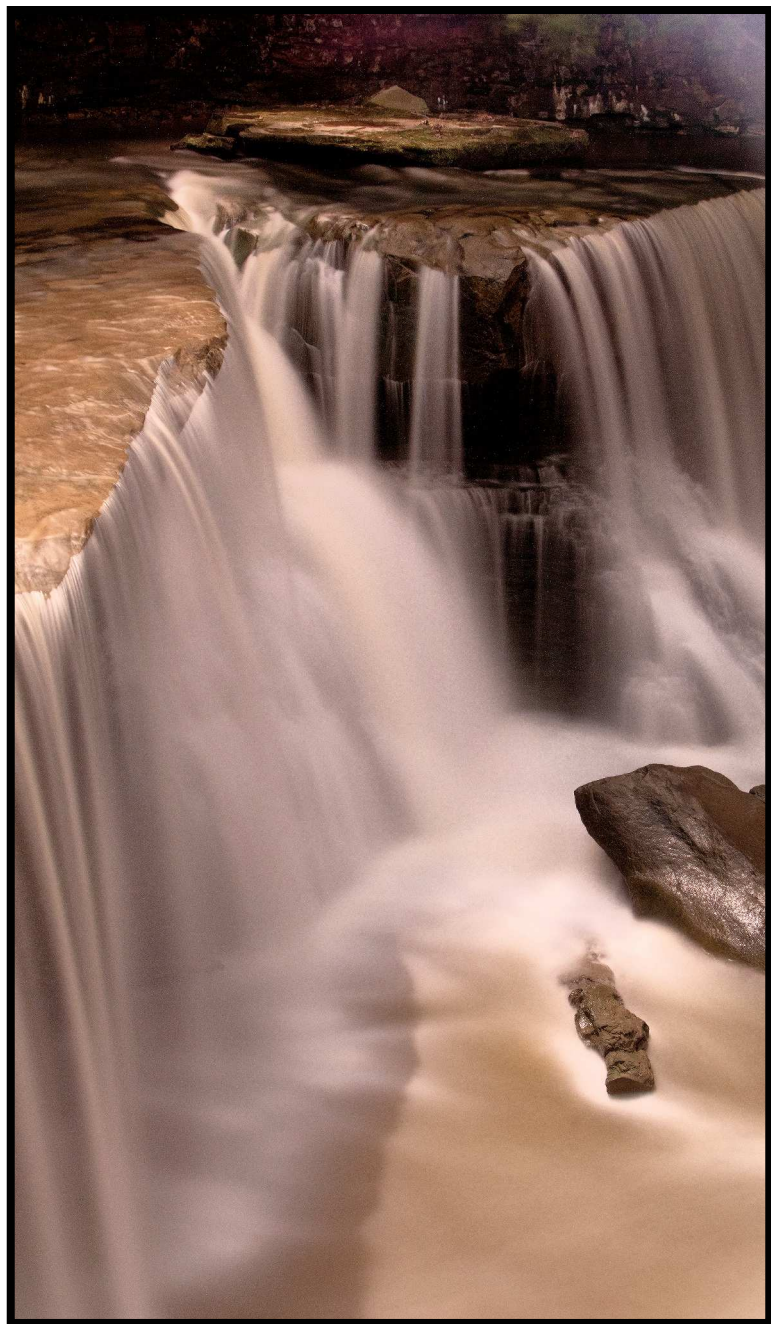
Lee Filters

You will want to review all lenses you have that you might want to use for Long Exposure.

If you have more than one filter size, consider buying the largest filter you need and adding stepdown rings to the smaller size.

Always get the filter to fit the largest lens and step down. If you go the other way you run the risk of having vignette issues in the image.





Some filters will use a holder/frame that will attach to the front of the lens, like a filter would. One advantage to this style is the holder/frame uses a ring that is available in different filter sizes. You can have a single filter set and mounting rings for each of your different lenses.

Most companies will offer a variety of filters for their system. From ND and Graduated ND to creative styles.

These sets will tend to be on the more expensive level when compared to a single ND filter.

Holder/Frame filter suppliers

Cokin

Lee Filter

Formatt Hitech

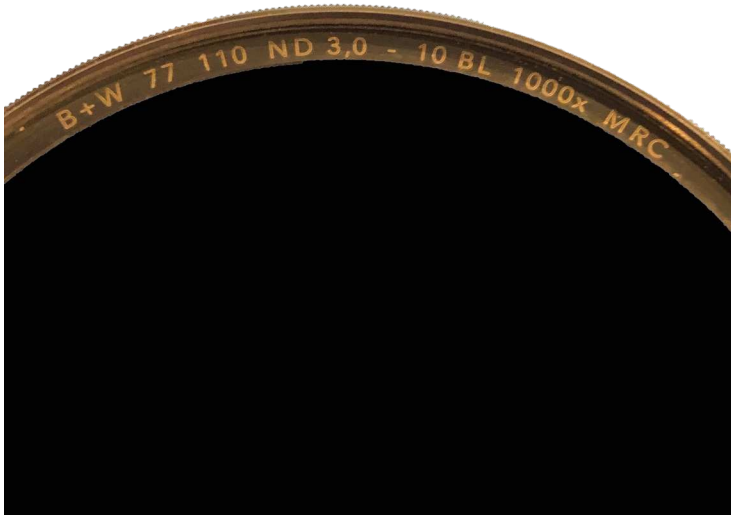
Singh Ray



Once you find the correct size of ND filter you will need to select the density factor or how dark will the filter be.

This is simply a representation of the factor by which the neutral density filter reduces the light coming into the lens. For example, an ND filter that reduces light by one stop has a filter factor of 2. A one stop reduction of light is always half the light

What do the numbers on the ND filter mean? Filters are marked with either a Filter Factor or Optical Density. Some manufactures use both. These numbers are a way to show how much the light will be reduced.



Filter Factor (ND2, ND4, ND16) shows the reduction of the light going through the lens by the number of stops or EV (Exposure Value). Anytime we reduce light by one stop, it is half the light.

So, a ND2 filter will reduce light by a factor of 2. That will be a 1 stop reduction.

A ND16 will reduce light by a factor of 16. That works out to a 4 stop reduction. This would be like changing aperture from f2.8 to f11. Using a ND filter doesn't affect depth of field.

f Stop Reduction	Density	Filter Factor
0	0	0
1	0.3	2
2	0.6	4
3	0.9	8
4	1.2	16
5	1.5	32
6	1.8	64
7	2.1	128
8	2.4	256
10	3	1024 /1000

So, now that you understand what those numbers mean, which filter should I get to start with?

I suggest a 6 Stop (ND64) as your first filter. You want to keep your ISO as low as possible at all times. Setting your camera to ISO 100 or 200 with an aperture of f11 to f18 gives you a typical exposure of 2-4 minutes with the 6 Stop filter. Using a 10 Stop is going to give an exposure time close to 8 minutes. This is an issue for a couple of reasons. Sensor Noise becomes an issue after around 4 minutes. Sensor noise happens from heat created by the sensor being active. The other issue is if you are looking to capture a sunset, it doesn't last 8 minutes.

So 6 stops is the one to start with. You can then add a 3 Stop (ND8) to give you a 9 stop reduction. Buy 2 filters get 3 filter factors.



If you are late in the day or sunset, even the 6 Stop might start to need 4 or more minutes of exposure. Time to switch down to the 3 Stop (ND8) filter and keep shooting in the 2-3 minutes max range.

A Filter Factor around 9 or 10-stops does however become very useful between 10AM – 4PM, when the sun and light tends to be much brighter and overhead and flat, or in environments such as Alaska or Iceland where daylight can last a full day. You will need those stops to get your exposure down.



WHAT ABOUT VARIABLE NDs?

Variable Neutral Density filters allow you to adjust the ND strength from 2-stops all the way to 10-stops, all in one filter. That means you only need to buy one and you are all set to go!

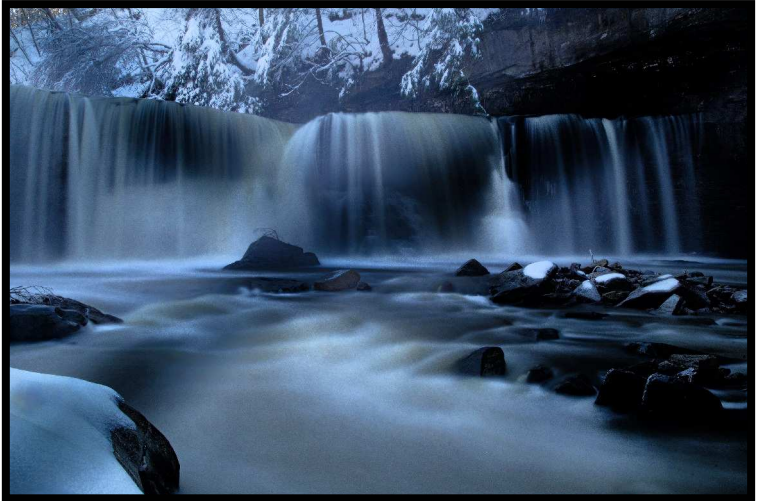
Unfortunately its too good to be true... They are 2 major issues that arise with Variable ND filters.

The first, is that the effect of the variable ND is achieved through the use of double polarization being rotated in opposing directions which causes a very apparent 'X' on images shoot with wide angle lenses.

The 'X' factor starts to occur at around 24mm and wider on full-frame setups. At 25mm it becomes less of an issue, disappearing completely at around 30mm.

The second reason is again due to the double polarization: polarizers are inherently not color neutral, and can exhibit a very strong yellow cast.

Combining two layers of polarizing film, both of which are not color neutral, simply makes the problem much worse.



Variable ND at a 24mm

In Long Exposure photography , we will use Time (Tv or S) , Manual (M) or Bulb. Which one you will use is dependent on how long you want to keep the shutter open (Shutter Speed).

I use either (M)anual or (B)ulb modes. I want to be able to independently control the Aperture and Depth of Field. (B)ulb is used when the shutter time is greater than 30 seconds. You will also want to fix the ISO. Set a low ISO and not Auto. If you set it to Auto ISO, the camera will want to drastically increase the ISO in some situations.

(B)ulb is the act of holding the shutter button down for how ever long you want the time of your exposure to be. Some form of remote trigger that can be locked open works best for this. You don't want to have to hold that button for 2 minutes or longer.



Setting your camera to Bulb will vary by make and model .

On most Nikon camera's

Turn your camera to Manual, and shift your shutter speed as long as it can go.

Usually, after the 30 second mark, your camera will show the letter “B” as your shutter speed. You are now in Bulb.

For Canon camera's, turn the mode dial on the top of the camera to **B**. This is Bulb mode.



Remember, when using the camera on (B)ulb, you have to hold the button down or lock it for the entire exposure time. A phone app or timer on watch makes this easier.

In addition to your camera /lens combination and ND Filters you will need the following equipment:

Sturdy Tripod – You can have exposures that are minutes in length.

Remote Shutter Release.

Phone App or timer for exposures over 30 sec.

Nice to have items:

Stool to sit on during exposure.

Second camera – allows you to photograph other subjects while waiting during very long exposures.





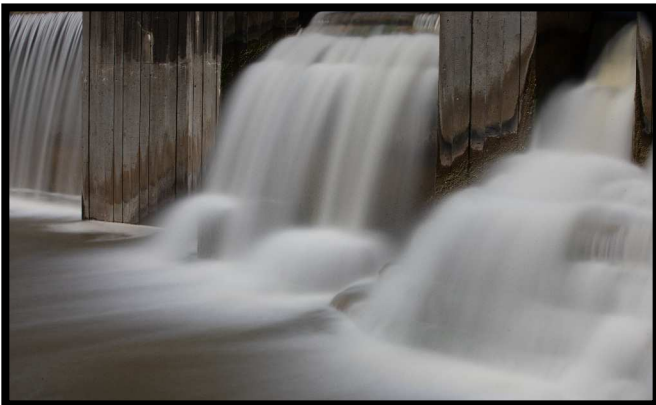
What is Long Exposure Noise?

When your camera is capturing an image, the sensor can get warm. The longer the exposure time, the warmer it can get. This warming effect produces amp noise on your image. These warm sections can have more noise than the cooler sections.

Amp noise will appear as a fogging / brightening around the edges of the image. You can also have bright color spots throughout the image.

Noise like this is different than high ISO noise. High ISO noise will look like grainy dark areas of the image, not the fog like noise that is more random.

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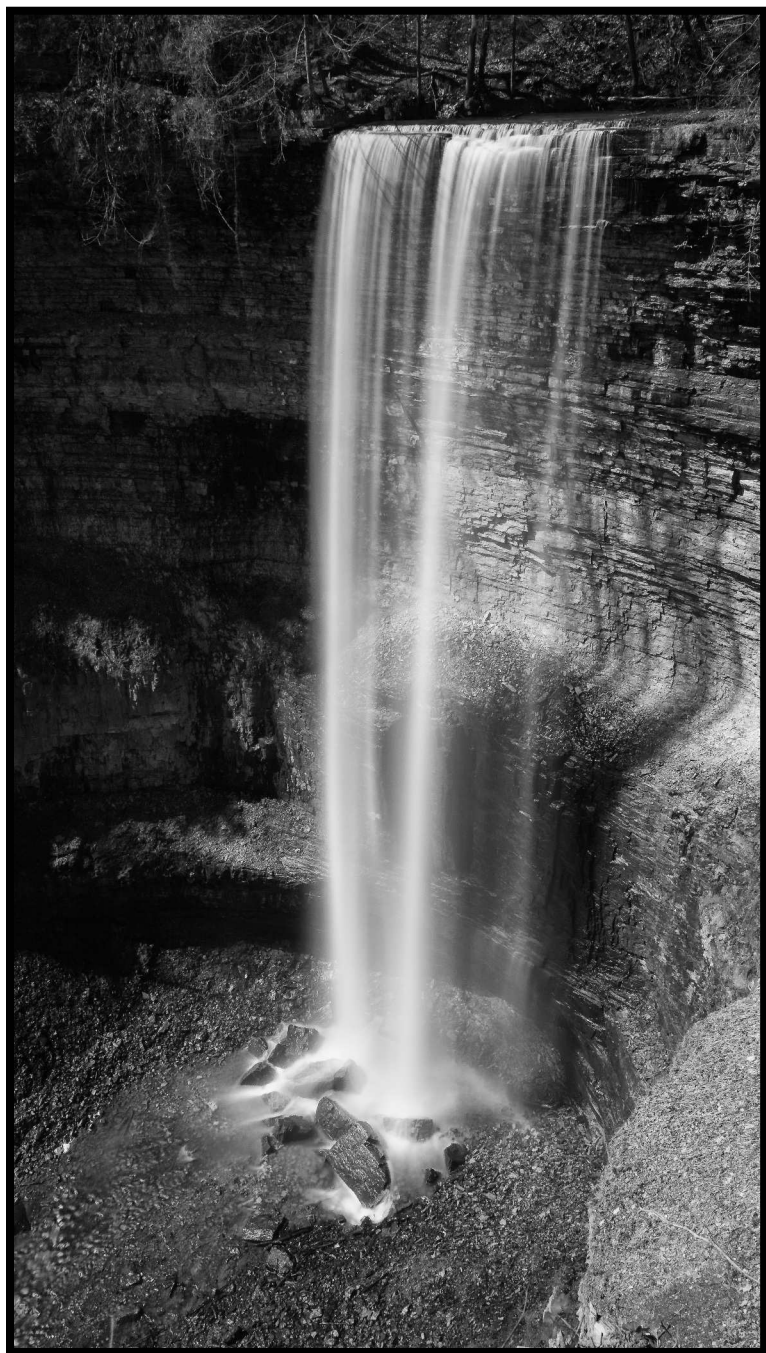


Most Digital cameras have a feature called Long Exposure Noise Reduction.

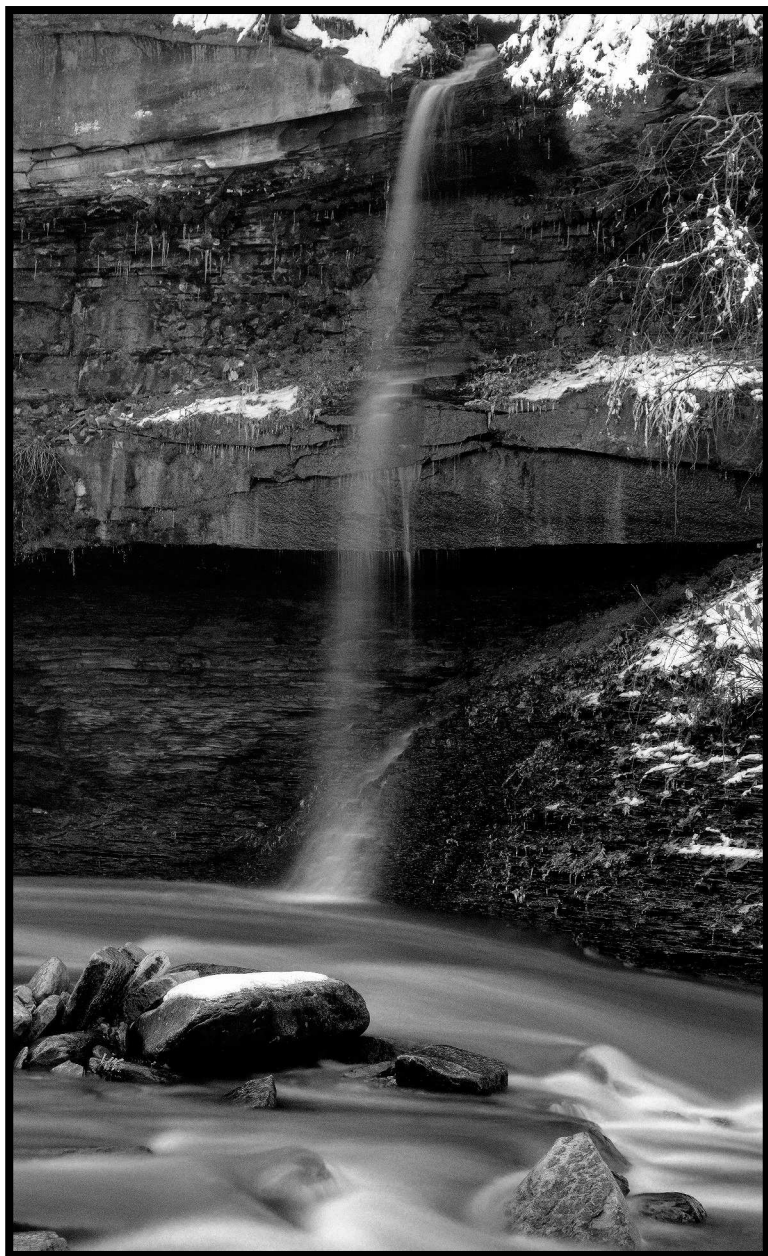
With this featured enabled, any exposure greater than one second will cause the camera to take two images. The first image is normal. The second will be approximately the same time and is what is called a black frame subtraction. The sensor is activated, but the shutter stays closed. The camera compares the noise in the black-frame subtraction exposure and removes it from the normal (first) image. It does work quite well, but will slow down your shooting. The time your camera is busy is double your exposure time. A 2 minute exposure means the camera is busy for 4 minutes.

In most cameras, this noise does not show up until you start have exposures over 2-3 minutes. Outside temperature can help. A nice cold winter day can reduce the heat from the sensor.

My recommendation is to disable Long Exposure Noise Reduction in the camera. I will always watch my exposure time and keep it down to an acceptable level.



Setup



Once have composed and focused your image select the ND filter you are going to use. Now it is time to calculate your exposure taking in to account the Filter Factor of the filter.

There are multiple methods to do this.

ND Filter:	3 stops	6 stops	9 stops	10 stops	13 stops	16 stops	20 stops
Exposure with no Filter:							
1/1000s	1/125s	1/15s	1/8s	1s	8s	1m	16m
1/500s	1/60s	1/8s	1s	2s	16s	2m	32m
1/250s	1/30s	1/4s	2s	4s	32s	4m	1h
1/125s	1/15s	1/2s	4s	8s	1m	8m	2h
1/60s	1/8s	1s	8s	16s	2m	16m	4h
1/30s	1/4s	2s	16s	32s	4m	32m	8h
1/15s	1/2s	4s	32s	1m	8m	1h	16h
1/8s	1s	8s	1m	2m	16m	2h	32h
1/4s	2s	16s	2m	4m	32m	4h	64h
1/2s	4s	32s	4m	8m	1h	8h	128h
1s	8s	1m	8m	16m	2h	16h	256h



There are many App's available for smartphones that will calculate your exposure for you.

These are just ones that I either use or have a recommendation.

Look for a timer function as part of the app. This simplifies exposures over 30sec



Apple OS

Long Exposure Calculator
by jcorales



Android

Exposure Calculator V 4.3.3

Method 1 App or Chart

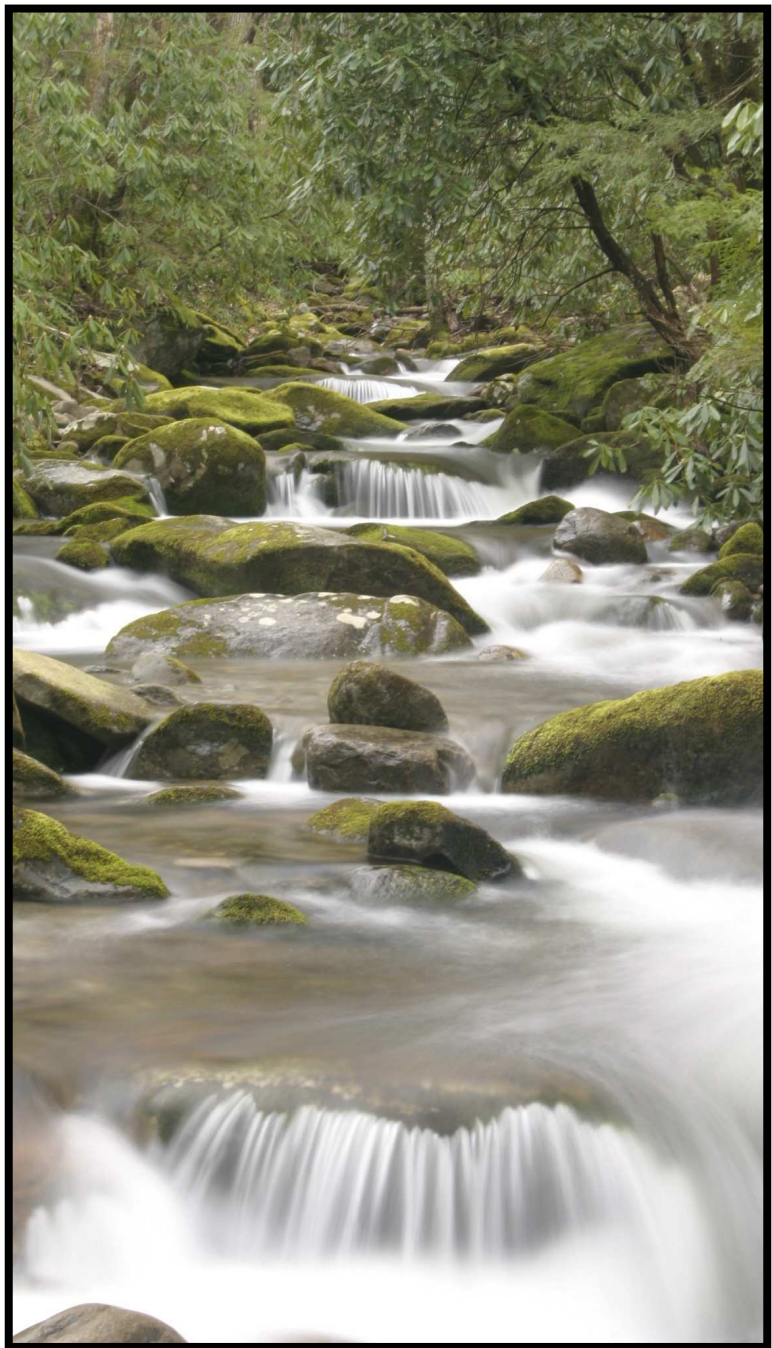
1. Start with Aperture Mode.
2. Set your aperture to one that will give you the desired depth of field. I prefer to be from f8 to f16. On most lenses, apertures in this range will be the sharpest (Acuity).
3. Set ISO to 100 to 200
4. Note what Shutter Speed the camera used for your base exposure.
5. Using either a chart or a App on your phone look up the new exposure time.
6. Switch the camera to Manual Mode.
7. Set ISO and Aperture to same as used in base exposure.
8. Enter the shutter time as shown on the App or Chart. If the time is greater than 30 seconds use (B)ulb Mode.
9. Install ND filter to the lens. Be careful to not change the focus.
10. Using Remote on camera, click the shutter.

Review the image and make adjustments as needed.

Method 2 Using Live View in camera

1. Set your camera to Manual Mode.
2. Set ISO to 100 to 200
3. Set your aperture to one that will give you the desired depth of field. I prefer to be from f8 to f16. On most lenses, apertures in this range will be the sharpest (Acuity).
4. Install your filter on the lens.
5. Turn on Live View on your camera.
6. Compose and focus your image.
7. You should be able to see your image in the display, through the filter.
8. Select the desired shutter time.
If the time is greater than 30 seconds use (B)ulb Mode.
9. If you press half done on the shutter button, The camera will meter the image and show Over / Under exposed on the Exposure scale at the bottom of the display. Adjust one of the 3 settings to move exposure left or right on the scale.
10. Using Remote on camera, click the shutter.

Review the image and make adjustments as needed.



Press the
Shutter

Once you begin to understand this type shooting ,
calculating the exposure will become easier.

Get creative with your shots.

Add more ND filters to get up to 15 , 16 or more
stops. You might find you have exposures lasting 5 –
10 minute or even hours.

Walk over and sit in you shot and see ghost images .

Once you have become comfortable, go out at night .

Won't need the ND filters as much. Great results just
the same.



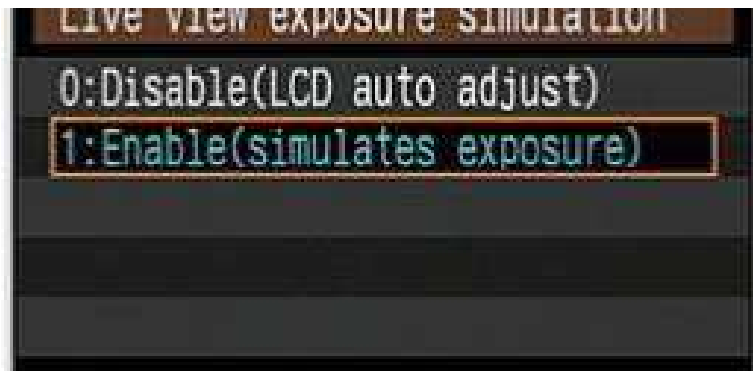
COMPOSING WITH ND FILTERS

When using a 6-stop ND filter or greater viewing anything in the viewfinder is impossible.

Up until the advent of incredibly high ISOs, photographers would have to un-screw the ND filter to focus and compose the shot or guess because viewfinders were nearly pitch black when using ND filters. Definitely not a good thing to guess about!

Now with high ISOs combined with Live View, you have the ability to use the high ISO for the purpose of composing.

But there's a catch.



By default there's feature called *Exposure Simulation* that's turned on, which displays onscreen what your exposure parameters are.

That's bad, so turn that off and keep it off.

Once disabled, you're all set to begin composing as normal, even up to 10-stop ND filters.

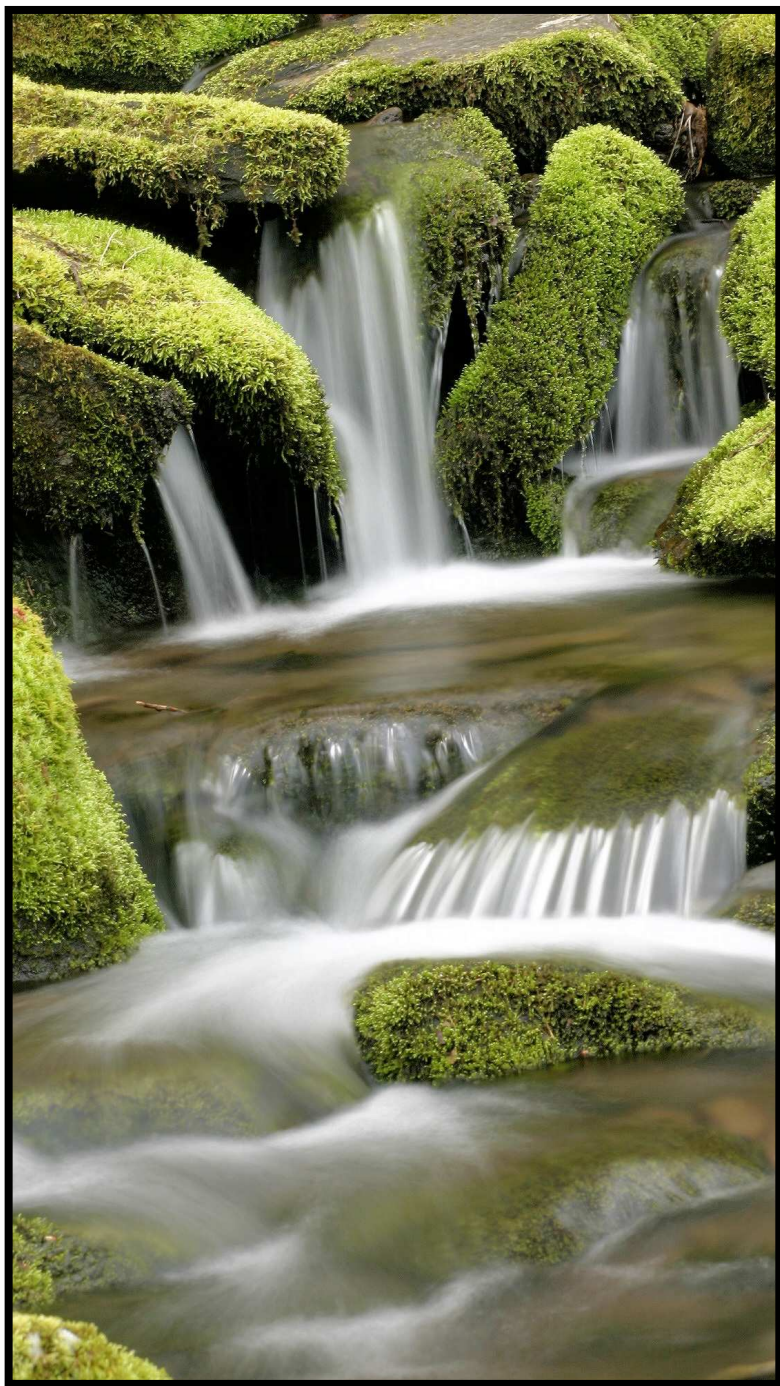
With longer exposure times ,light can leak through your SLRs viewfinder and adversely affects exposure. It can cause a halo effective on the edge of the image.

Any stray light affects exposure therefore you should always cover the viewfinder when exposing.

Cover the viewfinder with a black lens cloth and use the camera strap to hold it in place, especially on breezy days.

On mirrorless systems you don't need to do this, only SLRs.





Long exposure is not just for moving water. Moving Clouds that are captured using Long Exposure can add drama to your images.

All you need is a great subject and moving clouds in the sky. By slowing down the shutter time, clouds will take on a streaked look.



Using ND filter's is not just for landscapes , moving water and clouds.

Consider this use for a 3 stop ND filter. Use a 3 stop ND filter with outdoor portraits on a bright day.

You might typically use fill flash with outdoor portraits to compensate for a bright background. The challenge is you would still have a fast shutter speed up in the 1/1000th or faster.

Your flash can not sync at that speed.

Putting a 3 stop ND drops that shutter speed to 1/125th of a second, the perfect sync speed.

Having a 3 stop ND filter in your camera bag can solve challenges in other photography genre.

On a bright day use the 3 stop in action photos to slow down the shutter speed a couple of steps. In Panning, it might be enough to get you that shutter speed down to 1/60 or less and not have to stopp way down with your aperture. Remember, on most lenses f8.0 to f11 tends to be the sharpest aperture.

Now that you have seen that Long Exposure Photography is not overly complicated and can add a great new dynamic to you photography, go out and have fun with it.

Metadata for images shown

Front Cover 6 sec F/22 ISO 200

Page 2 1 sec F/8 ISO 100

Page 4 20 sec F/20 ISO 100

Page 5 50 sec F/8 ISO 200

Page 8 259 sec F/8 ISO 320

Page 12 146 sec F/10 ISO 800

Page 16 10 sec F/18 ISO 100

Page 17 3.2 sec F/11 ISO 200

Page 20 25 sec F/10 ISO 200

Page 22 13 sec F/16 ISO 100

Page 24 20 sec F/25 ISO 100

Page 26 13 sec F/22 ISO 200

Page 28 15 sec F/9 ISO 200

Page 30 3.2 sec F/11 ISO 200

Page 34 3.2 sec F/20 ISO 100

Page 36 2 Sec F/18 ISO 100

Page 39 1.6 sec F/18 ISO 100

Page 40 30 sec F/13 ISO 100

Page 43 0.3 sec F/14 ISO 100

