

Bill Wight's Night Photography Tips and Techniques

Updated October 15, 2012

This article will provide you some tips and techniques to get you started on night photography. I say get you started because almost every night shoot begins with an trial and error stage, determining the focus, depth-of-field requirements, ISO and aperture setting, shutter speed and composition for each scene.

I always set my camera image quality to RAW as I find I have more image information to use in post-processing.

Focus—

For night photography at places like the fair or other such nighttime events where there is lots of ambient light, it is possible to let the camera do the focusing. These situations usually have enough light for your camera's computer to find the best focus point. However, in most night photography situations, such as under moonlight and for star scenes, there is not enough available light for the camera to determine the correct focus point. In these cases you will need to focus manually. Set the camera/lens focus to M for manual. If you have a lens with VR or OS or whatever your camera manufacturer calls their optical stabilization, most experienced photographers shut this feature off.

Most DSLR cameras have difficulty focusing in very low light. In night photography where you want to capture the stars or Milky Way, there may be situations where you need to shoot with the lens near wide-open. You must determine where your lens is focused to infinity when it is near wide open. There are two ways to do this:

If your camera has Live Focus, this can make the focusing problem a snap. When you are set up at night, determine the optimum zoom or lens for the composition you want. Now set the camera for Live View and point the camera at a dark night sky or distant city lights. Zoom the Live View display and turn the focus ring the lens so the stars or distant lights are as sharp as possible not fuzzy blobs or donuts. Take a few test shots, zoom in on the display and see if you have them sharp. If they are ovals or donuts, try the process again. and you photograph stars that are sharp points. During the course of a night's shooting, you will need to repeat this procedure to make sure the focus is correct.

If you camera lacks Live View, in the daylight, put your camera on the tripod and with the aperture wide open place a distant object in the center of the frame, like trees on the horizon. Focus to make the horizon sharp. Now on the outside barrel of the lens, note where the focus point for infinity is. If it not where the infinity mark ∞ is, then use a piece of colored vinyl tape to mark the point. Some less expensive lenses do not have any focus point scale or indicator. What you can do is get the lens focused as discussed below on infinity and then lock the focus ring in place with a piece of masking tape so it cannot move. At home, before you go out on that night photo trip, try to take some star or distant city light shots and see if they are sharp points with the lens wide open. If not, then you need to do the infinity focus point technique again. You can also do a trial and error method to find you infinity focus point. At night set your camera on the tripod and put the lens on the infinity marker with the lens wide open. Set the zoom to where you will be night shooting. Take

a test shot of the stars or distant city lights. On the camera display, zoom in to maximum. The stars or smallest lights should not be ovals or donuts, but points if your focus is at infinity. If you do not see points, (they will be a bit fuzzy at maximum zoom in) then move the lens focus point away from the infinity mark and take another shot. Continue this process until you have found the sharpest point. Note or mark on the lens where this point is. Repeat this process at another zoom position.

Many night photography experts advocate shooting with your lens wide open or one stop down from wide open. Doing this will give you more light and a shorter exposure. In my night photography, I seldom do that. Instead, I usually set the aperture at f-8 to get an acceptable depth of field in my shot and to have my lenses perform at their 'sweet spot'. The quality of the lens you use will also affect if you can shoot wide open. Prosumer lenses (those designed to use on the APS-C sized sensors) will have more distortion on the edges than pro lenses (those designed for use on full-frame sensors). Also, the sensor in your camera will have an effect on how you shoot your night shooting. If you have a sensor with great low noise properties, it will allow you to stop down your lens. If your camera's sensor gets noisy above ISO 800, then you will have to use a wider aperture setting.

Depth Of Field—

Aperture setting: we all know that the higher the f-stop number (the smaller the hole in the diaphragm) the greater depth of field (DOF) we will have. This is another trade-off as a higher f-stop means less light is hitting the sensor during a given exposure time. So you want the lowest f-stop that will put your night scene in focus, from the closest object to infinity. When there are objects in the foreground, like a tree or boulder, then an aperture setting of at least f-8 is required. An aperture setting larger than f-8 will generally not give enough depth of field unless you are shooting with a super-wide angle lens. The longer the lens focal length, the less DOF it will have for a given f-stop and you will need a smaller the aperture to get your scene in focus (smaller means the size of the diaphragm hole and a larger the f-stop number).

If your night photography composition has objects that are close to the camera, then focusing on the infinity point will result in the close objects being out of focus. This is a good situation for using the Hyperfocal Distance Technique. In this technique, you do not set the lens distance scale on infinity, but on a point just inside of the infinity setting. Do a test shot and then zoom your camera's display to check focus for both distant and closer objects within the image.

ISO—

ISO setting will need to vary with the type of subject you shoot. In general, increasing the ISO will increase the noise within the image. The newest cameras have much better low light sensors than cameras from just a few years ago. For example, the Canon 7D has much lower noise at high ISO settings than does the Canon 40D and the 5D mark III has much better high ISO performance than does the Canon 7D. In the Nikon family, the new D600 has much better high ISO performance than does the D300 or the D7000. The D4, D3s and the D800 have the least noisy sensors available.

What is 'noise'?

Our digital images are created when light photons hit the sensor elements and produce a flow of electrons. In all such sensors, there is a degree of stray electronic noise that is inherent in the

electronic circuits. There are two common types of noise produced in digital sensors, brightness noise and color or chroma noise. We see brightness noise as unwanted pixels varying from white to gray to black. We see chroma noise as stray pixels of many colors in our image. What does noise look like? Below is an image from Ken Rockwell that show what chroma noise looks like.



This image shows chroma noise (the colored speckles) in an image where the ISO was set too high for a given sensor.

The ISO range that produces the lowest noise for a given sensor is between 100 and 200. However, this range is so low that you will need long exposures to capture most night scenes. So in most night photography situations, we will need to up the ISO setting. How high can we go? That depends on your camera's sensor and the conditions under which you are shooting. The best way to see what the upper limit of acceptable noise is in your camera is to go out at night and do some tests at several ISO settings. Then download the images to your computer and view them on your monitor.

Sensor Noise is increased under the following conditions:

Sensor Size--A full-frame sensor, will have noticeably less noise than APS-C used in cameras like the Canon 7D or Nikon D7000. Point and shoot cameras, with even smaller sensors, can be very noisy in low light conditions and these cameras are not recommended for night photography. Tests by DXO show that the Nikon D4 and D3s have the lowest noise levels of all DSLR cameras. The Nikon D800, D700 also have very good low noise capabilities. The top Canon cameras, the 1D Mark IV, the 1Ds Mark III, the 5D Mark III are all good cameras for night photography. In the prosumer class, the Canon 7D, and Nikon D7000 have acceptable low noise and are good for night photography. This is not to say that your Canon 40D or Nikon D90 will not give acceptable night photography results, it just means that your night photography images may have more noise at ISO settings above 1000. In fact, the price of the camera is a pretty good indicator of its low noise capability. Also, older DSLR cameras have more sensor noise than newer ones, a Nikon D200 will be a lot noisier at a given ISO setting than a D300. Even if you have an older or less capable camera, do not let that dissuade you from trying night photography. Remember, it is the photographer and not the equipment that makes great photographs. An older camera will limit what you can do at night, not prevent you from shooting.

Sensor noise increases with exposure time. So experiment and see what your camera is capable of. A new full-frame camera will simply expand your night photography horizons.

High ISO settings—the higher you set the ISO on your camera the more noise will be in the resulting photograph. This is a trade-off between a noisy night photograph and none at all.

High ambient temperatures--the higher the air temperature or camera temperature the more sensor noise you will see. If you are shooting in a place that is hot during the day, try to keep the camera as cool as possible. Some night photographers in hot climates, like in Death Valley in the spring or summer, keep their cameras in a cooler. Be sure that the camera does not get wet while in the cooler or get condensation on it when you take it out.

Underexposure—will increase the noise in the darker areas of the image.

The Long Exposure Noise Reduction feature found on many newer digital cameras works by making a second exposure of the same length as the first with the shutter closed. This determines the electrical and thermal background noise in the sensor. The camera's computer then subtracts this background noise from the image.

If your camera does not have such a feature, you can create a 'dark frame' image by taking an image with the camera's lens cap on and your viewfinder eyepiece blocked for the same amount of time as your night photograph. Then in Photoshop, you put the 'dark frame' in a layer above your night image and use the Blending Mode 'difference'. This technique will remove pixels from your image that appear in the 'dark frame' image.

White Balance or Color Temperature settings—

This is a setting that will not be applied to the RAW capture but will be passed into Lightroom or Photoshop Adobe Camera RAW and applied there. You can adjust the WB to give a cool or warm effect to your night photographs. For night photography scenes illuminated under moon or starlight, use a Daylight setting for WB. Under artificial lighting, you will need to make a few test shots to see what setting gives the best results. Use your camera's display to determine the best setting. Even when shooting in RAW, it is best to get the WB as close to ideal in the camera as possible.

Shoot The Moon—

Remember, if you are including the moon in your photograph, it will be overexposed compared to the rest of the scene. If you want to capture detail on the moon itself, you need to realize that it is like shooting in daylight, which is what is illuminating the moon's surface. To capture features on the moon usually requires an exposure of ISO 200 at f-11 for 1/125 second. To have your moon with surface detail in a moonlight scene, you will need to make an exposure that captures detail on the moon and then a second exposure that captures the rest of your night scene and combine these two images in post-processing. Both shots will take some trial and error to get the correct exposure.

Star Points and Star Trails—

When you photograph the night sky, and have a dark sky not illuminated by artificial lights, you should be able to photograph the stars. Whether they appear as points or trails will be a function of how long you exposed the image. For DSLR cameras, the general rule is that for a wide-angle

lens, an exposure under 30 seconds will give you star points. Longer than 30 seconds will give you star trails. Longer lenses will reduce this time. For a 200mm medium telephoto lens, you must limit your exposure to 3 seconds to have a star appear as a point. The general formula is: $500 / \text{lens focal length}$, so $500 / 20\text{mm} = 25$ seconds; $500 / 200\text{mm} = 2.5$ seconds.

To capture stars as points it is necessary to increase your ISO setting to around 1600.

To make the stars show as trails in the sky, you need to make longer exposures. The star trails in the northern hemisphere will be more curved the closer they are to the north star, Polaris. The star trails will be less curved when they are farther away from the north star. To make long arch star trails requires hours-long exposures. Unfortunately, most digital sensors get very noisy when capturing an image over long periods.

Another and better way for keeping noise out of your star trail images is to photograph stars in a series of short exposures, like 15 seconds, over several hours. Then you combine the images using an image 'stacker program'. Here are links to several free ones:

www.StarStaX.net and www.deepskystacke.free.fr and www.astronomie.be/registax

To do this, you need a programmable remote shutter release AKA an intervalometer. These are available on eBay for your camera model for \$20 and up.

Not So Dark Skies—

It is getting harder to find really dark skies. Even in places like Joshua Tree National Park, you will get a sky glow if you shoot toward the west as you will pick up the lights of Palm Springs. While shooting in Death Valley and pointing your camera east, you may find you have a sky glow from Las Vegas. In the Eastern High Sierra shooting toward the west or northwest will give you sky glow from the Bay Area. For really dark night skies, I hear that the deserts of Namibia are still quite dark. ;>)

Shutter Speed—

Your shutter speed will vary depending on the type of night photography you are shooting.

For scenes at the fair or events where you want to capture people, a short exposure is needed, usually about $1/30^{\text{th}}$ of a second. It is always best for night photography to use a tripod. Few of us can hold a camera still enough to get a really sharp image at $1/30^{\text{th}}$ of a second. In automatic mode, with Auto-ISO set to On, the camera's computer will try to balance all the shooting parameters to get the best shot. This may or may not be the best for your particular shot. If you need to stop motion, like people walking, you may have to put the camera in Shutter priority. If you need depth of field, you may have to put your camera on Aperture priority.

For most night photography we need to put our shooting mode in "M" for Manual mode. You do not want the camera to automatically determine the exposure in most night photography scenes.

As mentioned above, stars are exposed for a few seconds to several hours.

To photograph buildings that you light paint, use the Bulb setting. On this setting, the first push of the shutter release opens the shutter and the second closes the shutter. You can also use a remote programmable shutter release for this.

Some night photographers insist that you should lock the mirror in the up position before the exposure. This they say reduces movement. However, most of my night shots are exposed for several seconds and the light is so low that any movement in the first fraction of a second is not recorded. I never bother with the lens lock-up as it is just another thing to keep track of.

To photograph vehicle lights on a street or highway, you want the exposure to be long enough that the vehicle travels completely through your frame. So you need to do some timing tests, counting how long it takes a vehicle to move through the frame and make the exposure a few seconds longer. In this situation, you must use the ISO setting to get the correct exposure as you want to set the f-stop to around f-8 or f-11 to get a good depth of field.

Even though there are some basic rules for nighttime photography, it comes down to just making test exposures to end up with the best photograph. Each scene you photograph will be different. Always check your camera display after the exposure and zoom in to make sure the scene is in focus and you have exposed it correctly.

General Tips—

A clear night with or without the moon is best for star photography. A scene with moonlight will light the land portion of your scene. On a dark night, your land portion will be black and you are looking for a silhouette against the stars. Trying to shoot stars within a city is a sure-fire way to get frustrated. The lights of a city will overwhelm the faint light from the stars and Milky Way. Also, clouds, fog, smog and haze will degrade your attempts to shoot the stars. So I only shoot the stars and the Milky Way when I am far away from the city, like in the high desert or mountains.

For Milky Way photography, a higher ISO is necessary, around 1600. You want to keep your exposure as short as possible to minimize movement of the stars as the earth rotates around its axis. Longer exposures will make the Milky Way look fuzzy. Also, clouds in the sky will make the stars and Milky Way look out of focus or fuzzy.

How I Shoot For Night Photography—

- 1 I put my camera on my tripod, use a remote shutter release and make sure the camera is level. My new Nikon D800 has a Level Indicator in the viewfinder and on the display.
- 2 I do not find it necessary to do a mirror lock-up.
- 3 Make sure there are no light sources that are shining directly toward the camera. If you are in a city area, use lens hood or a large card to block any direct light.
- 4 I use the viewfinder to compose the scene. If dark, I use big flashlight to illuminate the scene or parts of the scene for composition and focus.
- 5 For star photography, focus is critical. I use LiveView and zoom in on the display. If your camera does not LiveView, pre-focus the lens to infinity during daylight and mark where infinity is on lens barrel.

6 Make several test shots at different ISO settings. I can often see the noise when I zoom in on the camera display.

7 I always make test runs for focus and DOF. On the zoomed display I can see if I have the required DOF.

8 For long exposures, beyond 5 seconds, I always use the Long Exposure Noise Reduction feature on my Nikon cameras.

iPad and Android Apps For Night Photography:

My landscape workshop partner James Neeley uses these two iPad apps:

SkySafari 3 (\$2.99) by Southern Stars – Locates all major night features with a time function. You can determine when and where the Milky Way will be at any time in the future and for any place.

www.southernstars.com/products/skysafari/index.html

Light Trac (\$4.99) by Rivolu Pte Ltd - for iOS and Android. James says this is the best program for determining sunrise, sunset, moonrise and moonset times and phases of the moon. The program also gives sun and moon angles on a map to plan your shots. You can download Google maps for the area you will photograph and the App will show sun and moon angles on the maps even when you are out of cell tower range.

<http://www.lightracapp.com/>

<http://itunes.apple.com/us/app/lightrac/id392892355?mt=8>

Other Night Photography Apps—

Many photographers use The Photographer's Ephemeris (TPE) program for iOS and Android (\$10) and Mac and Windows (free). This program will show you the sunrise and sunset times as well as moon rise and set times and show the ground tracks of these events.

<http://photoephemeris.com/>

Darkness (\$1.99) and Photoluna (\$3.99) are iPhone apps for studying Sun and Moon times and positions. Photoluna has a live compass and will point to the part of the sky where the Sun and Moon will rise and set.

<http://bjango.com/iphone/darkness/>

<http://banasmoo.com/products/photoluna/>

iMoonU (\$0.99) displays the phase of the Moon for the current or any future date, and it has a monthly lunar calendar and full moon countdown.

<https://itunes.apple.com/us/app/imoonu/id291335435?mt=8>

Starmap Pro (\$18.99) is one of the best apps for stargazers and astronomy buffs. It contains more information than most of us will ever need.

<https://itunes.apple.com/us/app/starmap-pro/id309367681?mt=8>

Field Tools (free) is a basic app that calculates depth-of-field and hyperfocal points.

<http://itunes.apple.com/us/app/field-tools/id305817254?mt=8>

Tack Sharp (\$0.99) is another depth-of-field and hyperfocal calculator.

<http://itunes.apple.com/us/app/tack-sharp/id320142569?mt=8>

DoF Calculator (\$1.99) and DOF Master (\$1.99) are very easy to use with camera lists.

<http://itunes.apple.com/app/dofmaster/id300820570?mt=8>

Here is a blog that discusses apps-for-night-photographers”

www.jmg-galleries.com/blog/2011/11/15/9

Luminos (\$4.99) - Astronomy for iOS By Wobbleworks

<http://itunes.apple.com/us/app/luminos-astronomy-for-ios/id404664336?mt=8>

Redshift (\$11.95) – Astronomy for iOS By USM

<http://itunes.apple.com/us/app/redshift-astronomy/id390436752?mt=8>

Another night photography process is one called photo staging. This is where you use targeted lighting to build up your finished image from many individual shots. The web page below will take you to a website where you can watch several excellent videos on this process.

<http://americanprideandpassion.com/>

Here is a link to Jason Page’s light painting tutorials:

http://www.youtube.com/watch?v=uXID_HqdmxE

<http://www.youtube.com/user/LightPaintingPhoto>