

Bill Wight's Night Photography Tips and Techniques

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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.

Starting Settings:

When beginning a night photography session, here are the settings I begin with. All night photography is an exercise in 'trial and error' until you find the camera settings that work for the scene you are shooting.

Camera Mode: Manual

ISO: 1000

Aperture: f-7

Shutter speed: 15 seconds

Focus: Manual (turn off auto-focus)

Long Exposure Noise Reduction: Off for now

High ISO Noise Reduction: Off for now

Image Quality: Either RAW or Jpeg

White Balance: Daylight or Auto

I always set my camera image quality to RAW. This gives the most digital image information to use in post-processing.

You will capture better night photographs with a full-frame sensor camera than you will with a crop-frame sensor. This is because the full-frame sensor cameras will generally have lower noise. Even with a crop-frame sensor camera, night photography is fun and you will be able to capture some very good images. Night photography will open up an entire new 'universe' for you as a photographer.

One of the most important things you can do is to get ready for a night photography shoot before it is dark. Charge camera batteries, clean your sensor and get your camera set up for the night session. Check your flashlight and make sure they have fresh batteries. Have your colored gel filters handy. Be prepared for the weather with what you need in the way of clothing, gloves and hats. Some like a camp chair and a thermos filled with a hot drink. Others just tough it out. If you are out in the boonies, be prepared for when nature calls. Scout your night photography site during daylight hours. Know where to park and how to get to the photography site. On remote locations,

during the late afternoon, I have placed little LED candle-lights at points along the route to help me find my way that night. I never go into an area at night I do not know without first scouting it during the day. Everything looks different at night. A place you can easily find in daylight may be very difficult to locate at night. Be especially careful when going off trail at night. It is easy to get lost or hurt. Safety first.

Equipment—

A tripod with pan or ball head. Headlamp with red light to preserve your night vision. A tiny pen light with a red or amber colored-lens to check camera settings. Small flashlight for light painting. I find the warmer tungsten bulbs are better than harsh and bluer LED lights. In general, you do not need very large flashlights for light painting. An extra fully-charged camera battery is good to have as night photography will deplete a battery faster than daylight photography. A larger flashlight is good for using on a night hike to the photography site.

Night Photography Group Etiquette—

When you are in a group of photographers who are learning night photography, there are a few things each member can do to make the process go smoothly. I have taught over a hundred people night photography techniques. Night photography is not like daytime photography. It is not possible to 'just snap' and get an OK shot. The process is a lot more complicated but I have never failed to help beginners to get some great night images. Many of the night shots will involve light painting. For this to work members of the group must coordinate their shots.

- 1) Realize that not all members of the group have the same level of night photography expertise and they will be slower to setup and take each photograph. Have patience and offer help to those who are beginners.
- 2) Watch where you point your headlamps and flashlights. Be considerate not to ruin the night vision of your other group members.
- 3) What we usually do is have the members of the group get ready for the night shot. We all shoot the same exposure settings. We will count down from three and at one, each participant hits their shutter release. During this time, all headlamps and flashlights are off.
- 4) If you are having difficulty and the group is ready to make their shot, just skip that one. Do not get frustrated. Do not hold up the group. When the shot is complete, ask the group leader or another member for help between shots. We usually do multiple shots of the same setup and scene.
- 5) Do not walk in front of another member and get in the way of their shot.
- 6) Some night photography shots take place in limited-access positions. Not all members of the group can get the shot at the same time, so please be patient for your turn.
- 7) If the group thing is not working for you, move away and do your own thing. Please be considerate of the group and do not point lights in their direction.

General Tips:

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.

In other 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. You will need to focus the camera/lens manually so take your it off Auto-focus, AF, and to 'M' for manual focus. If you have a lens with VR or OS or whatever your lens manufacturer calls their vibration reduction or optical stabilization, I suggest you turn this feature off.

To capture the stars or Milky Way, there may be situations where you need to shoot with the lens wide-open or near wide-open and you must determine where your lens is focused at infinity. The small infinity symbol ∞ on the exterior of the lens may not be the true setting for focus at infinity. There are two ways to determine your infinity point.

1) If your camera has Live Focus, this can make the focusing problem easier. When you are set up at night, determine the optimum lens and or zoom setting for the composition you desire. Set the ISO on your camera to a high value, like 3200 or 6400. Now set the camera for Live View and point at a dark night sky or distant city lights. On the back of your camera, zoom the Live View display to the highest magnification. Now move the camera on the tripod to get a bright star or the moon in the center of the display. Turn the focus ring on the lens so the moon, stars or distant lights are as sharp as possible. The stars will not look sharp, but make them as small as possible, not fuzzy blobs or donuts. Take a few test shots, zoom in on the camera's display and see if you have the moon, lights or stars sharp. A Hoodman display magnifier is very useful for this. If the stars are ovals or donuts, try the process again. During the course of a night's shooting, you will need to repeat this procedure to make sure the focus is correct. Some night photographers bring some black gaffer's tape with them and tape the focus ring so it cannot move during the night shoot. [Your group leader will have some black gaffer's tape].

If your camera lacks Live View, in the daylight, put your camera on the tripod with the lens you want to use and set to the widest zoom, like 16, 18, 24mm, 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, take note of the focus point for infinity lines up. 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 on infinity and then lock the focus ring in place with a piece of gaffer's 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 your 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.

Some night photography experts advocate shooting with your lens wide open or one stop down from wide open. Doing this will allow more light to reach the sensor and a shorter exposure at a lower ISO. However, this will greatly limit the depth of field in your image. In addition, sharpness falloff at the edges of your image will occur. I often set the aperture at f-7 to f-9 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. Non-professional lenses (kit lenses and 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 sensor cameras and usually costing over \$1,000). Also, the sensor in your camera will have an effect on your night shooting. If you have a sensor with great low-noise properties, it will allow you to stop down your lens and use a higher ISO setting. If your camera's sensor gets noisy above ISO 800, then you will have to use a wider aperture setting.

Depth Of Field—

Nothing ruins a night shot like it being out of focus. If you have a rock or tree in your foreground that you light-painted and the stars are sharp but the rock or tree is fuzzy, that image is going onto the discard heap. If the tree or rock is sharp and the stars are fuzzy, same situation.

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-7 is usually required. An aperture setting larger than f-7 will generally not give enough DOF 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 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 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.

Don't forget to mark the infinity point on your lens.

Another technique that works well when you need extra DOF for closer objects is to make an exposure with the foreground objects in focus. Then take a second exposure with the camera focus set on infinity. In post-processing with Photoshop or Lightroom 5, you can blend the close-focus exposure with your distance-focus exposure. This technique is called 'Focus Stacking' and especially useful when your night composition has very close foreground elements as well as stars in the sky.

The only way to determine if your composition is in focus when you are in the field at night is to zoom your camera's display to maximum and see if the elements in your shot are sharp or fuzzy. Again, the Hoodman type of display magnifier is very helpful.

ISO—

The ISO setting (sensor sensitivity) you need will 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 D700 and the new D610 have better high ISO performance than do the D300s or the D7100. The Df, D4, D4s and D3s are the best low noise models. The Nikon D800 will have more noise than the Nikon Df, D4, D4s and D3s models because the individual photo elements are much smaller.

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 very long exposures to capture most night scenes. Very long exposures cause noise. 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 processor and the conditions under which you shoot. 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. For the newer cameras (introduced in 2012 or later), ISO settings of up to 6400 or higher give acceptable night sky images.

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.

The Long Exposure Noise Reduction, LENR, 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. The disadvantage here is that your camera will take more twice as long to complete and record the image to the memory card. So if you take a 5 minute exposure with the LENR on, you will have to wait 10 minutes for the shot to be completed and saved to your image card. In my night photography, I have never had to make exposures longer than thirty seconds and the use of the LENR feature is not a problem. Remember to turn off LENR when you shoot a series of exposures to capture star circles.

If your camera does not this 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 'Subtract' or 'Difference'. There are also specialized programs that will do this, like StarStax, StarTrails or Image Stacker. This technique will remove pixels from your image that appear in the 'dark frame' image.

Hot pixels—Every digital sensor has some to many defective photo sensor elements. These are generally not noticeable in a daylight shot but can be very noticeable in a dark shot. They show up as white or colored squares or rectangles when you view the image at 100% on your computer. You get rid of these using the Long Exposure Noise Reduction setting or by creating a 'dark frame'. If you used neither of these techniques, then the Photoshop or Lightroom Spot Healing Brush in post-processing will do the trick.

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 Develop Module or Photoshop Adobe Camera RAW and applied there. If you shoot in Jpeg mode, the WB setting you have set in the camera will be applied to your saved image. 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 view your night image 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.

Changing the WB can give you different effects in the image. You can make your scene bluer or redder by adjusting the WB. Some night photographers will set their camera for shoot a WB exposure set.

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 you night scene, stars and light-painted objects, and combine these two images in post-processing. Both shots will take some trial and error to get the correct exposure.

If you are shooting your scene that includes the moon and are using a super-wide angle lens, be aware that the moon will appear tiny in the image. If you are comfortable with creating night images that do not necessarily depict the natural scene, then a technique I use is to photograph the moon at a telephoto setting and then add that moon to my wide-angle scene. This is look unnatural but can sometimes work well.

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. As the earth turns, the stars will be recorded as trails on your image sensor. Whether they appear to the human eye 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 what appear to be star points. An exposure longer than 30 seconds and you will see star trails in the image. Longer lenses will reduce this time. For a 200mm medium telephoto lens, you must limit your exposure to about 3 seconds to have a star appear as a point.

The general formula for a full-frame sensor is: $500 / \text{lens focal length}$, so $500 / 20\text{mm} = 25$ seconds; $500 / 200\text{mm} = 2.5$ seconds. For a super-wide full-frame lens: $500 / 14\text{mm} = 35$ seconds.

For a crop-sensor, APS-C, it is $500 / (1.5 * 20\text{mm}) = 16$ seconds; $500 / (1.5 * 200\text{mm}) = 1.6$ seconds.

Stars — Points versus Trails?

This is a matter of personal choice. If you want the stars in your image to be points, then you must expose accordingly. Sometime short of longer trails can add to your composition.

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, say an hour or more. I do not recommend taking any night exposure for star trails longer than 30 seconds. Image noise will build up to an unacceptable level.

Another and better way for keeping noise out of your star trail images is to photograph stars in a series of short exposures, like 15-30 seconds, over one to two hours. Then you combine the images using an image 'stacker program'. Here are links to several free ones:

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

www.startrails.de/html/software.html and www.tawbaware.com/imgstack.htm

To do this, you need a your camera to have the time-lapse feature or to get a programmable remote shutter release, AKA an intervalometer. These are available on eBay for your camera model for \$20 and up.

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 are 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.

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.

Exposures of 20-30 seconds will often surprise the photographer with a glow in the lower section of the sky they did not see with their naked eyes. The only way around this is to shoot in another direction or location. I find it almost impossible to get good star shots near urban areas. The lights of a city will overwhelm the faint light from the stars and Milky Way. You can get very good shots of bright planets or the moon over city lights, so all is not lost when having to shoot in urban areas at night.

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. Your position and that of the vehicles moving through or across the frame will determine the DOF you need. If the road and vehicle are far away, then you can use a wider aperture. If you are close to the road and vehicle, then you must determine the required DOF to make all the elements of your composition in focus. If you are on the top of a mountain pass and the vehicle lights you want to capture are far off, then you can use an f-stop near wide open. If you are near the vehicle and they are moving toward or away from you will need a smaller aperture setting, like f-7 to f-9. At the smaller aperture setting, your ISO will need to be higher.

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 and the White Balance is giving you to color balance you want.

More 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. There is nothing more boring, except to an astronomer, than a night photograph of nothing but stars. Your composition must capture something in the lower portion of the image to be interesting to viewers. A flat horizon is almost as boring as no horizon.

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 shoot with the Nikon D3s and the Nikon D800. I put my camera on my tripod, I use a remote shutter release and make sure the camera is level. Many newer cameras have a built-in horizon 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 powerful flashlight to illuminate the scene or parts of the scene for composition and focus. Some photographers like a green laser to help 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. I a Hoodman display magnifier for checking focus and excessive noise.
- 8 Long Exposure Noise Reduction: For long exposures, beyond 5 seconds, I always use the feature on my Nikon cameras.
- 9 High ISO Noise Reduction: In the Nikon when shooting RAW (NEF) this function does not do anything to the captured image. It sets a flag that the Nikon NX2 software reads and that external computer then applies noise reduction. If you are capturing your images in Jpeg format, then the camera will apply NR to the image prior to saving it. I have this setting in my camera set to 'Off'.

iPad and Android Apps For Night Photography:

I recommend these two iPad and Android tablet apps:

SkySafari 4 (\$2.99) by Southern Stars – Locates all major night features with a time function. You can determine when and where the moon and bright planets and the Milky Way will be at any time in the future and for any place.

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

Android: www.southernstars.com/products/skysafari_android/index.html

Light Trac (\$4.99) by Rivolu Pte Ltd - for iOS and Android. This is an excellent 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 network range.

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

<http://itunes.apple.com/us/app/lighttrac/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 on its maps.

<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.img-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/>