

Night Sky Photography

Provided by Saugatuck-Douglas Friends of the Night Sky

Plan Ahead

- Pick a location - and scout it out during the day
 - Consult the [light pollution map](#) or its app - a Bortle rating of 4 or lower is best
 - Note interesting foreground elements, such as trees, mountains, rocks, or a lake.
 - Watch out for light sources - distant city lights and nearby residences, parking lots, or businesses. Clouds can reflect light from sources below the horizon.
- Set a date and time - allow time for multiple shots, experimenting with settings
 - Milky Way - West Michigan sees its core best in March-Sept.- [Capture the Atlas calendar](#)
 - Northern lights forecast - check the [NOAA website](#) or the [Aurora Alerts app](#)
 - Meteor showers - see the calendar on the [IMO website](#) - try the Perseids in August
 - Start time - full darkness comes after [astronomical twilight](#) (sunset + 40-90 min.)
 - Moonlight - check the [moon phase, rising/setting times](#).
 - Cloud forecast - [Clear Outside website](#) or Astrospheric app for [iPhone](#) / [Android](#)
 - [PhotoPills](#) app (\$10.99) - info on the moon, Milky Way, meteors - helps plan shots
- Consider your comfort - you may spend a fair amount of time waiting
 - In cold weather, overdress - you won't be moving around much
 - In summer, bring bug spray and a folding chair
 - Park your car in a safe place and turn off the interior lights.
- If you're using a camera - charge the battery and bring a spare
 - Storage - make sure there's lots of room on the SD card or other medium
 - Remove any lens filters and cover LED lights with electrical tape
- If you're using a phone - charge it and bring a battery backup. [Example](#)
 - Storage - make sure there's lots of room for photos — [iPhone](#) | [Android](#)
 - Phone case - you may need to remove it before using a tripod

Human Eyes at Night

- Practice using your camera in the dark by touch, so you don't need to use a light.
- Our eyes need 20-30 minutes to adapt fully to the dark. If you need light, use a flashlight or headlamp with a low-wattage red bulb - but don't shine it in someone's eyes.
- Pay careful attention to your surroundings, so you don't trip or knock something over.
- Night vision is largely limited to black & white. A camera captures the full range of colors and collects more light; that's why aurora photos look more colorful than what we see.

Tips

- Inspiration - check out the winners of DarkSky's annual [Capture the Dark](#) photo contest.
- Panorama - take separate photos and use software to stitch them together.
- Time-lapse video - show stars moving, airplane trails, meteors.
- Reflection - photograph the sky in a calm lake or other body of water.
- Unwanted light - move your camera so that something blocks the light source.
- Foreground - use available light to shoot what's on the ground (illuminating the foreground is frowned on in most public places). Layer the image on with editing software afterwards.

Camera Notes

- Camera body - use a mirrorless one. Example: [Canon EOS R100](#) (\$500-600)
Manual control of shutter speed, aperture, and ISO
 - Lens - use a wide-angle. Example: [Canon RF16mm f/2.8](#) (\$230-300)
 - Aperture under f/4 with a manual focus option
 - In general, zoom lenses don't focus as well as ones with a single focal length
 - A more expensive lens will probably have better optics and take better shots
 - More gear
 - Tripod (\$90-300+) - sturdy, stable. Example: [Manfrotto](#)
 - Intervalometer (\$30-40) - a programmable remote that can shoot a specific number of photos at a set interval. It also has a self-timer and does long exposures. [Example](#)
 - Tracker (\$300+) - Attach it to a tripod and point it at the North Star. It follows the movement of stars across the sky along one axis. You get sharp stars, not a sharp foreground. Examples: [iOptron SkyGuider Pro](#) / [NOMAD star tracker](#)
 - Dew heater (\$15-25) - warms a lens to prevent dew from forming. [Example](#)
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Smartphone Notes

- Android phones have a "Night" or "Night Light" mode
 - [Google Pixel](#) has an automatic [astrophotography mode](#) that does stacking
 - [HD Camera 2025](#) is a free app that provides controls for night photos
 - iPhones have [night mode](#); it even works with the wide-angle lens and time-lapse.
 - [NightCap Camera](#) (\$2.99) is a good app for star trails, time-lapse videos, long exposures
 - Resources: [Excellent web page](#) (esp. for Android) || [Blog post](#) w/overview videos & more
 - More gear
 - Remote shutter release - use a Bluetooth remote ([example](#)), the volume button on wired earphones ([example](#)), or a smart watch
 - Tripod + phone mount. Examples: [mount for your tripod](#) | [phone tripod + mount](#)
 - Tracker with a phone mount. [Example](#) (\$300) - requires a substantial tripod.
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Settings

- Focus - can be challenging - use **manual**, not autofocus
 - Set to infinity or focus on a distant object, such as mountains or the moon
 - Live View - if your camera has this, find a bright star, zoom in, and focus on it
- Shutter Speed - start with 5-10 seconds - too long creates star trails
[The 500 Rule](#) - focal length x max seconds = 500 -- for example, 25 sec. x 20mm
- Shutter delay (self-timer) - 2 seconds or more - helps avoid camera movement
- ISO - try 3200 - high to get more light, too high adds digital noise
- Aperture - f/2.8 - try not to use the widest f-stop (smallest number)
- White balance - 3400 to 4400 (not necessary with RAW format)
- File type - RAW format yields large files, but provides more options in post-processing
- LCD/screen - an image preview in the dark isn't a good indication of actual brightness
With a phone, turn the screen brightness way down or use "red mode," if available
- Histogram - look for a large peak on the left, and gaps on the right and left edges
- Turn these off - mirror lockup, exposure bracketing, and long exposure noise reduction

Image Stacking

Stacking combines multiple images of the same scene, aligning and blending them to create a composite image with less noise. It also eliminates star trails. As the Earth turns, each star moves in an arc across the sky. A tracker moves the camera, keeping the stars in the same position in the shot for hours. Without a tracker, the stars will stop being aligned, creating more work for the stacking software.

Over time, the position of the foreground relative to the stars will change. If you want something earthbound in your image, you'll have to do some post-processing.

Process

- Take several photos in a row using the same settings. Shoot for at least 4 minutes, if possible. The smaller the aperture (higher f/), the more photos you should capture.
- Manually remove shots you don't want (ones that have clouds, airplane trails, etc.)
- What the software does
 - Aligns the images.
 - Stacks the photos and take the average of each pixel.
 - Uses dark frames to determine the camera's noise profile and eliminate brighter and darker regions.
 - Reduces background noise, exposing stars too dim to see in a single exposure.
- Touch up any areas that the software masks incorrectly.

Software for Stacking

- [Sequator](#) - popular - for Windows - free
- [Starry Landscape Stacker](#) - for Mac - \$40
- [Astroshader](#) - iPhone - free
- [Photoshop](#)

NOTE: *Some publications and photography competitions do not accept stacked photos.*

Post-Processing

Software like Adobe Lightroom can improve image quality, but it's best to limit your adjustments. Drastic changes can make a photo look unnatural. Below are some common techniques.

- Exposure - increase it to brighten a shot
- Contrast - boost it to make stars pop
- Clarity - increase the definition of stars and the overall scene
- White balance - give the sky a deeper blue color or a warmer tone
- Highlights - bring them down to prevent stars from looking overexposed
- Shadows - lift them to reveal foreground details
- Levels - darken background grey so it's black, lighten levels above to make stars more visible
- Sharpening - bring out fine details, but don't overdo it
- Noise - reduce it, but be careful not to lose details, such as the texture of the Milky Way
- Layer mask - use one to apply an adjustment to a specific area, such as the foreground

DarkSky's Principles for Responsible Astrophotography



DarkSky

1. Use light responsibly

Protect the nighttime environment and the experience of others by limiting the addition of artificial light in nighttime photographs.

2. Promote honest representation

Capture an authentic experience of the night sky by being transparent about the editing process, labeling composite images, and ensuring the night sky aligns with the geographic location of the foreground.

3. Respect dark sky locations

Follow [Leave No Trace](#) principles to protect sensitive areas, and abide by local laws and regulations when visiting parks, reserves, and communities. Travel mindfully to minimize impact.

4. Practice responsible astrotourism

Astrophotographers are an integral part of astrotourism. Follow DarkSky's [Principles of Responsible Astrotourism](#) to support the sustainable growth of this industry.

5. Manage expectations

Astrophotography is both a scientific and artistic pursuit. Raising awareness of the differences between what a camera captures and what the human eye perceives can help set realistic expectations, especially for people experiencing dark skies for the first time.

6. Share your passion

Many people only experience dark skies through photographs. Use your work to inspire others and build awareness of the importance of protecting the night.

Source: <https://darksky.org/news/darkskys-principles-for-responsible-astrophotography/>