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Thread: Focusing Questions

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Member

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Aperture selection and focusing for landscapes

Quote:

> Originally Posted by **fredmitcham**
> *When shooting landscapes how do you guys usually focus?*

For landscape photography, I use DOFMaster spinning disk calculators (one for each prime lens and one for each focal length marked on my zooms) to determine both the focus distance and the working aperture. I print them on heavy paper and then laminate both disks before attaching them together with an "OIC Brass Fastener" (search for this string at www.staples.com, for example.)

The trick is to select the right Circle of Confusion diameter when customizing the DoF calculators. Here's a formula I recommend for selecting the Maximum Permissible Diameter for Circles of Confusion:

Max. CoC Diameter (mm) = 1 / enlargement factor / desired print resolution in lp/mm

Enlargement factor is simply the ratio of the print dimensions to your sensor or film dimensions.

For desired print resolution, I recommend a value of 4- to 8-lp/mm when you want the print to survive scrutiny at a viewing distance of 10 inches. 4 lp/mm will satisfy most people and anything greater than 8 lp/mm would be overkill. If you only want to satisfy a viewing distance of 20 inches, you can cut the desired resolution in half. Note that 2 lp/mm requires an image file resolution of 100 dpi, 4 lp/mm requires an image file resolution of 200 dpi, 6 lp/mm requires 300 dpi, and 8 lp/mm requires 400 dpi (that's native pixels - without resampling during resize).

Having calculated your Maximum Circle of Confusion Diameter for the anticipated enlargement factor and desired print resolution, specify this value on the DOFMaster "Properties" screen. This one Circle of Confusion value will be appropriate for all focal lengths.

There's one last thing to worry about with aperture selection. You can't use the aperture indicated by the DOF calculator if doing so will cause diffraction to inhibit your desired print resolution. In other words, there's no point in stopping down further to make the Circles of Confusion caused by defocus smaller at your chosen Near and Far sharp distances if doing so is going to make diffraction's Airy disks (across the entire image) larger than your Max. Permissible CoC diameter.

Here's a formula for determining the aperture, f/N, at which diffraction's Airy disks will begin to inhibit the desired print resolution at the anticipated enlargement factor:

N = 1 / enlargement factor / desired print resolution / 0.00135383

When you create your DOFMaster spinning disk calculators (or whatever you choose to use for DoF calculations) mark the calculator with this calculated f/Number and NEVER stop down any further (unless you're willing to consciously forfeit some print resolution). If the DoF calculator says you need f/22, but your calculated diffraction stop is f/16, then you need to increase the camera's distance to the Near sharp without changing the focal length -or- reduce the focal length without changing the distance, until f/16 will provide sufficient DoF. Another alternative is to just make up your mind to reduce the enlargement factor - make a smaller print than the size you specified in the two formulas above. Reducing the print dimensions by 1.414x will allow you to open up one stop. Reducing the print dimensions by 2x will allow you to open up two stops.

Remember, there's a difference between resolution (captured subject detail) and

acutance (edge sharpness). It's easy to make a "sharp" print, but really difficult to make a print that has a lot of detail in addition to being sharp - detail as fine as the eye can detect (4- to 8-lp/mm) at a viewing distance of 10 inches.

Use a heavy, stable tripod. Use MLU if your camera offers it. Use a long, flexible cable release, a wireless remote control, or the camera's self-timer. This goes without saying, but I'll say it anyway - use a shutter speed that's fast enough to arrest subject motion. If the DoF calculator says you can shoot wide open or nearly wide open, don't do it - stop down a couple of stops to avoid the aberrations suffered when wide open (this assumes you're not purposely trying to limit DoF).

If, over time, diligent adherence to focusing at the distances indicated by your DOFMaster calculators does not provide sufficient DoF at the Near and Far sharps, it will most likely be due to focusing errors (or errors in estimating the Near/Sharp distances). Give yourself some margin for error by stopping down a little bit further than indicated by the DOF calculators - but don't exceed the f-Number at which diffraction becomes a problem.

Obviously, there are factors other than defocus, diffraction, and camera or subject motion that can prevent us from achieving a “desired” print resolution at a given enlargement factor – not the least of which is the number of pixels provided by our sensors. If you want to make a 19-inch print with a 12.8 megapixel Canon EOS 5D, it’s impossible to resolve more than 4.4 lp/mm of true subject detail at the print - equivalent to a non-resampled image resolution of 224 dpi. 300 or 400 dpi would require resampling and resampling can not magically inject subject detail that wasn’t in the original capture. Products like Genuine Fractals can generate false detail, but a distant person, whose face was unrecognizable in the original capture, will still be unrecognizable.

In any case, no matter what tools you intend to deploy in your post-capture workflow, it’s a lot easier to make the proverbial silk purse out of silk. Discipline yourself to do the best you can with the camera, first.

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