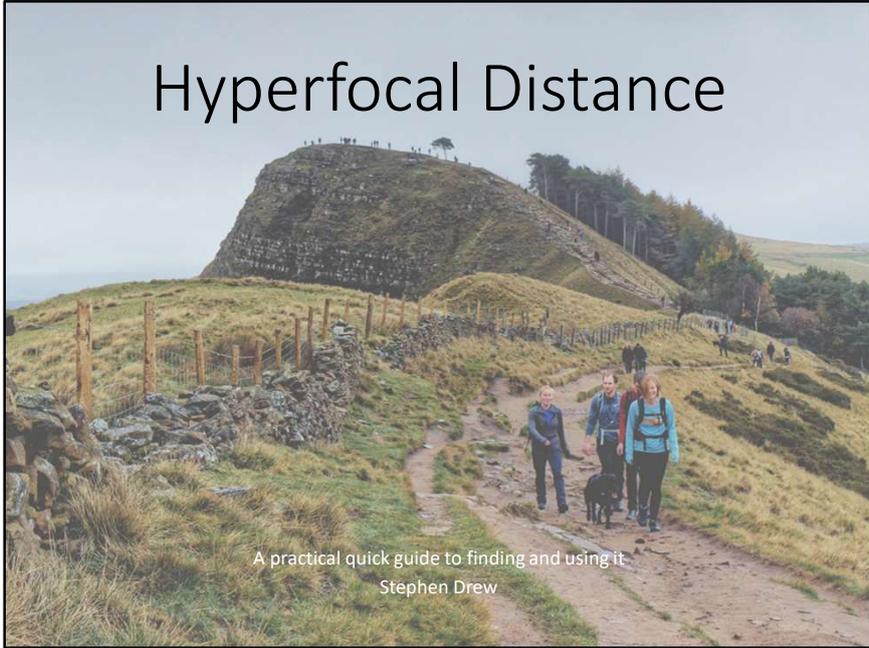


Hyperfocal Distance



A practical quick guide to finding and using it
Stephen Drew

What IS Hyperfocal Distance?

Hyperfocal distance, at its simplest, is the focusing distance that gives your photos the greatest depth of field.

E.G. consider a landscape where you want everything — foreground and background — to appear sharp.

If you focus on the foreground, the background will appear blurry in the image. If you focus on the background, the foreground will look out of focus!

What IS Hyperfocal Distance?

How do you fix this?

Simple: you focus at a particular point *between* the foreground and the background, which makes both the foreground and the background elements of the scene appear *reasonably sharp*.

This focusing point is called the hyperfocal distance (HFD)

(Definition courtesy of Photography Life)

What IS Hyperfocal Distance?

Note the words

Reasonably sharp

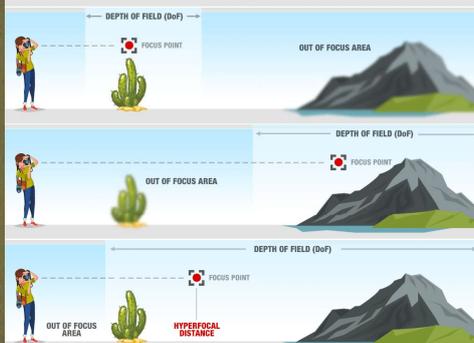
If you want pin sharp front to back, then you should use focus stacking, taking multiple images into the scene

The reality is that in most cases, HFD will give you a screen or a print image that will be sharp enough for contests or web use with few issues.

You do not need to worry if you are not EXACTLY on the distance. In practical terms, even a metre in front of the HFD or behind will not affect the final image, though focusing a meter beyond the HFD will shorten the amount in focus in from, rarely an issue in landscapes.

HYPERFOCAL DISTANCE

for landscape photographers



Hyperfocal distance refers to the point at which you focus a lens to maximize depth of field.

If you focus at the hyperfocal distance, you get the largest possible part of the scene sharp (in focus).

When using the hyperfocal distance, you'll render everything from half of the hyperfocal distance to infinity acceptably sharp.

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Before we start

Before you do anything you MUST either have your camera set to

AF set to Back Button Focus

Or

Camera set to manual focus

Otherwise you will set your camera up for HFD and as soon as you press the shutter the focus will change.. Which defeats the point!

Back-button focus

Back-button focus is a camera technique that separates focusing and shutter release to two separate buttons.

It is a useful way to stop the camera's autofocus system from getting continuously engaged when the shutter is released.

If your camera supports this I thoroughly recommend you do this.

Check online for your camera make and model for how you can set this up

Once you have separated the two functions you have a lot more freedom and less mistakes

You can set the focus (HFD or any other method) then compose the shot, moving the camera if needs be.

When you press the shutter release you will not alter the focus at all, something that is likely to happen if focusing and shutter release are on the same button.

Before We Start (II) – not strictly necessary but useful to know!

What is your lens's "sweet spot"?

Telephoto lenses are NOT uniform in quality of focusing across apertures and focal lengths and produce the sharpest images at certain values

Primes do vary according to the aperture and you should avoid wide open or closed down extremes

For the Canon 24-70mm f/4 L this is at f/8-11, so I tend to shoot at these values. With modern software this is not as critical as in the past, but as a certain shop says "Every little helps"!

So How Do We Calculate HFD?

Now we are set to go, how do we work out the HFD in practice?

There are a few ways to do this

So How Do We Calculate HFD?

Figure 1

Depth of Field Formulas

$$H = \frac{F^2}{f * c} + F \quad N_L = \frac{S * (H - F)}{H + S - (2 * F)} \quad F_L = \frac{S * (H - F)}{H - S}$$

Hyperfocal Distance *Near Focus Limit* *Far Focus Limit*

$$CoC = \frac{\text{Viewing Resolution}}{\text{Print Size / Image Size}}$$

All measurements must be in the same units, millimeters, feet, or inches.

- | | |
|--|---|
| F lens focal length | f aperture <i>f</i> -stop |
| c circle of confusion | S focus distance (subject) |
| H hyperfocal distance | N_L near distance for acceptable sharpness |
| F_L far distance for acceptable sharpness | |

Erm, lets give this a miss for now
and look at rather easier methods

So how do we calculate it without maths and equations?

The easy way is to use tables or DOF calculators

Either a pocket card or more likely a phone app of which there are many available

The screen shots used here are mostly from Photopills developed by two Spanish photographers. It isn't free (around £10) but does almost anything you might need

For the examples I am using a Canon 80D with the EF 24-70L F/4 at 24mm

This method works with any body, lens and focal length
btw

Example Hyperfocal Chart

11:13

← Hyperfocal Table perfocal Table

Camera Canon EOS 80D Canon EOS 80D >

Hyperfocal distance (m) Hyperfocal distance (m)

Focal length (mm)	f/7.1	f/8.0	f/9.0	f/10	f/11	f/13
24	4.33	3.86	3.44	3.07	2.74	2.44
25	4.69	4.19	3.73	3.33	2.97	2.65
26	5.08	4.53	4.03	3.6	3.21	2.86
27	5.47	4.88	4.35	3.88	3.46	3.08
28	5.89	5.25	4.68	4.17	3.72	3.32
29	6.31	5.63	5.02	4.47	3.99	3.56
30	6.75	6.02	5.37	4.78	4.27	3.8
32	7.68	6.85	6.1	5.44	4.85	4.33

Visual Alt AR Action

Laser Distance Meter



available at


Light, cheap and easy to carry (make sure it is waterproof) and routinely used by estate agents and builders, they fit easily into a pocket

Select a target (a tree or rock will do) that you THINK is at the HFD and measure it

Move forward till you get the HFD value on your meter and then get your camera and focus on the object you just measured.

IF you have a scale on your lens, note this value (you can use it again and again)



The only issues with the laser are:

On a bright day it can be hard to see the red dot. You can overcome this by aiming at (say) a tree trunk that is in shade)

Also, once you get above 10m (30' in old money) it can be hard to see a tiny red dot outdoors on a rough surface like a rock or tree

By Eye

Thanks (!?) to Covid, most of us now have some idea of how far 2m is, so why not use that knowledge?



For most HFDs we will be using 2 – 8m distance, which we can estimate and pace out.

Try comparing a laser measure and eyeball.

If the HFD is 3m (say), then that is 1.5 x Social Distancing.

2 apertures, 2 different HFD's yet same DOF limits?



You Only Need 1 HFD per Focal Length!

Sounds weird, but once you have the HFD for a particular focal length you don't need to change it for different apertures (and even lenses). Thus my 24mm prime pancake lens will use the same figures as my 24-70 set at 24mm and using 7.1 – 11mm focal length

DoF near limit at f/5.6 is 1.52m

Stopping down to f/11 and this reduces to 1.51m!

In other words you gain 10cm Dof in front of you as a result of stopping down. Unless you have a near object very close, you do NOT need to recalculate the DoF when changing aperture.

Depth of Field Near Limit, refers to the area between you and the Hyperfocal distance that will remain in focus.

For the example above, the distance from 1.52m in front of you to the HFD at 3m will be in focus.

The distance from you to 1.52m will not be in focus

As we are doing landscape, even our 'JCBs' will be unlikely to be this close to use

HFD charts are wrong

Remember how we said that the words “acceptably sharp” don’t mean pin sharp?

Another HFD method involves taking account of the Circle of Confusion that is part of every camera. Your model of camera will have a minimum size based upon sensor size. Calculating it is complex as it relies upon sensor size, final output image size etc. Photopills will do that for you, but often we don’t know what we are going to print it out at.

The same image may also be used on the web.

The circle of confusion means that, although your image will be acceptably sharp front to back, either the front or the back will be slightly sharper than the back or front. You can’t do anything about this unless you calculate the correct CoC and then use that number when calculating the correct HFD

In many circumstances, this will not matter. I doubt any but the keenest eye will have noticed the difference in the images that I have shown to the group over the last few months, as ALL were done using HFD tables and/or laser measure.

Read the article at the end from Photography Life if you are interested in looking at the theory more) or

https://en.wikipedia.org/wiki/Circle_of_confusion#:~:text=In%20optics%2C%20a%20circle%20of,when%20imaging%20a%20point%20source.&text=In%20photography%2C%20the%20circle%20of,image%20that%20is%20acceptably%20sharp.

HFD charts are wrong

So what can we do that doesn't involve multiple shots and different calculations?

- Find the closest element in your photo. Estimate how far away it is. Double that distance, and focus there. (That's the real hyperfocal distance, as defined by equal foreground and background sharpness.)
- If the closest element in your photo is one meter away, the hyperfocal distance is two meters away. If the closest element in your photo is ten feet away, the hyperfocal distance is twenty feet away.
- This is called the double-the-distance method, and it's something that should be stuck in the head of almost every landscape photographer.

Focus twice as far as your closest object.

Done.

Courtesy Photography Life

When to use HFD

HFD is a technique that is highly useful but isn't needed for all shots.

The misty mountains in the background will not be pin sharp whatever method you use

If there is no foreground interest then perhaps focus deeper in the scene

You may want a blurred foreground or background

HFD is a technique, one of many that we can use in landscape photography, and when you use it will be down to what YOU want from a scene.

Summary

If you want, HFD can be very complex but as I hope I have shown, for practical purposes in the field it doesn't have to be.

I have suggested a few ways of using HFD and now you should give them a try, find out which works best for you and which YOU think gives you the best results

Reading

https://www.amateurphotographer.co.uk/technique/camera_skills/mastering-hyperfocal-distance-56978

<https://www.photopills.com/calculators/hyperfocal-table>

<https://photographylife.com/why-hyperfocal-distance-charts-are-wrong#why-are-hyperfocal-distance-charts-inaccurate>