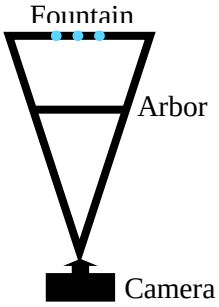
Understanding Our Lenses

Perspective

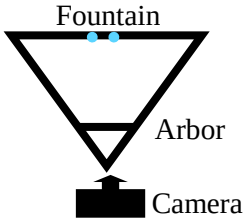
Using different focal lengths & camera positions changes the relationship between foreground and background elements in a photograph.

- Using wider focal lengths causes distant subjects to appear smaller and further away from the foreground.
- Using longer focal lengths causes distant objects to appear larger and closer to the foreground.

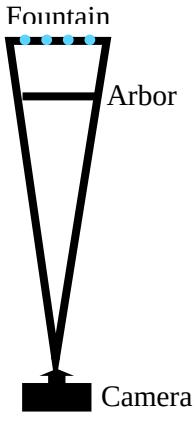
The three following images were shot so the Arbor was the same size in each photo while the fountain seems to change size.



With a 50 mm lens on a full frame sensor the view is similar to the view we have with our eyes.



With a wider lens, the distance between foreground subjects and distant subjects, seems exaggerated and background objects appear smaller. The view is similar to what we get on a cell phone.

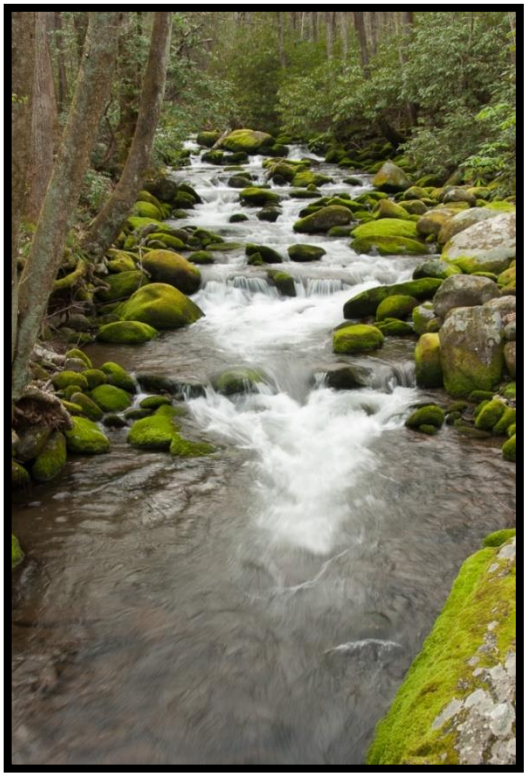


With a longer lens, the distance between a foreground subject and distance subjects, seems reduced and background subjects appear larger.

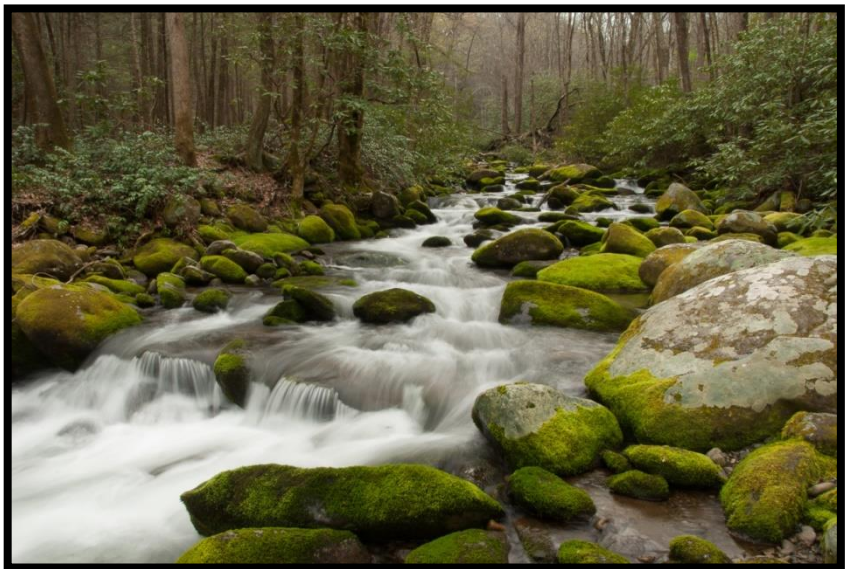
Perspective

Changing camera position and focal length can create a more powerful composition.

Focal Length
28mm @f11



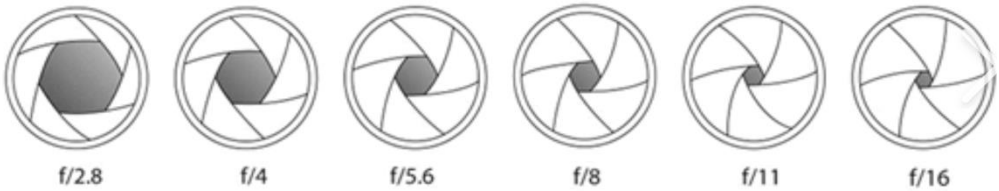
Camera Position & Focal Length
18mm @f22



Sensor Size Lens Factors

SENSOR SIZE	LENS FACTOR	FOCAL LENGTH	EFFECTIVE FOCAL LENGTH
Full Frame 36mm x 24mm	1	50mm	50mm
APS-C 24mm x 16mm	1.5	50mm	75mm
MICRO 4/3 18mm x 13.5mm	2	50mm	100mm

Depth of Field / Aperture Size

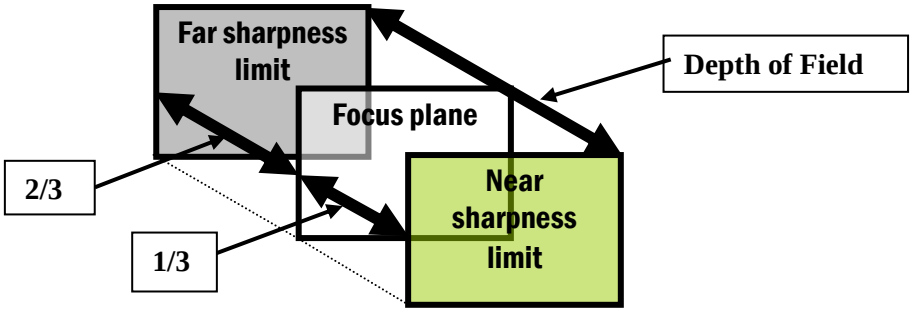


Smaller numbers =
Smaller depth of field

Larger numbers =
Larger depth of field

Depth Of Field

Knowing what will appear to be in focus (and what will be out of focus) is one of the most basic considerations when making any photograph. Although exact focus occurs only at the precise focusing distance, apparent depth of field can vary considerably.



The depth of field range depends on aperture size and subject magnification (focal length & focus distance). The 1/3-2/3 concept only holds true for relatively close-up photography. For more distant subjects see Hyper Focal Distance below, Or use depth of field preview feature on the camera.

- **Aperture:** As the aperture number gets smaller Depth of Field becomes smaller. And as the aperture number becomes larger, everything gets sharper.
- **Magnification:** As subject is magnified, depth of field becomes smaller and the foreground and background become softer.
- **Background:** As the background gets farther away from point of focus detail becomes softer.

Hyper Focal Distance

The focus distance that will keep everything from half that distance to infinity in focus.
EXAMPLE – If you focus at 8 feet, everything from 4 feet to infinity will be in focus.

One method to determine hyper focal distance is to us a phone app. Many phone apps are available. **Hyperfocal** app by **Syleos Apps** is free, simple and easy to use.

Another method is using a chart designed for **your specific sensor size**.
At http://www.outsight.com/hyperchart.php you can make your own chart.

Note: The chart below is for an **APS –C (24 x16mm)** sensor. Use a chart for your sensor size**.**

For the lens and aperture chosen, focus at the hyper-focal (chart distance). After focusing, do not refocus. The depth of field will begin at half the focus distance and extend to infinity.

	f/8	f/11	f16	f/22	f/32
24mm	12ft	9ft	6ft	4ft	3ft
28mm	16ft	12ft	8ft	6ft	4ft
35mm	25ft	18ft	13ft	9ft	6ft
50mm	50ft	37ft	26ft	19ft	13ft

Lens Exercises

For each exercise, **write down** the focal length used and lens & camera settings for use when comparing your images.

Exercise #1 - How camera distance and focal length change an image.

- Find a scene with a foreground and middle ground subject.
- Take a photo of the scene with a wide angle, normal and telephoto focal length.
- Before taking each photo, adjust the distance between the camera and the foreground to keep the foreground subject the same size. Or keep the middle ground subject the same size.
- Compare the images on a computer. What are the differences?

Exercise #2 - How different focal lengths impact perspective and depth of field.

- Photograph the same scene with a wide angle and telephoto focal length from the same position.
- Use a tripod and don't move the camera.
- On a computer, compare the perspective and depth of field. What are the differences if any?
- On a computer**,** crop and enlarge the wide angle shot to the same size taken with the telephoto lens.
- Compare the perspective and depth of field of the cropped image to the telephoto image. What are the differences if any?

Exercise #3 - How different focal lengths and camera positions change composition.

- Photograph a subject from different distances with the same focal length. For example photograph a tombstone from 50 feet, 30 feet, 15 feet, and 5 feet with 50mm.
- Repeat with different focal lengths.
- Repeat from a lower and higher position.
- On a computer, study the images to understand how your lenses and positions changed composition.

Exercise #4 - How aperture impacts depth of field on subject and background.

- Use a moderate (90 - 200mm) telephoto lens to shoot a subject up close at all available apertures.
- Use a tripod and don't refocus or change camera or subject position.
- On a computer, compare the images for depth of field on the subject and on the background. What happened?
- Try several series with different distances to the subject and between subject and background.
- What happened?
- Try another series with longer and shorter focal lengths. What happened to the background?

Exercise #5 – Make a chart for your lenses

Example

Lens	Aperture	Focus Range	Notes
14-150 mm Zoom	F4-5.6 to 22	12 inches to infinity	General shooting, landscapes
75-300mm Zoom	f4.8-6.7 to 22	52 inches to infinity	Wildlife
100-400mm Zoom	f4-6.3 to 22	41 inches to infinity	Wildlife
60mm Macro	f2.8 to 22	3.25 inches to infinity	1:1 & close-ups