

PPI & Viewing Distance



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There is often a great deal of misunderstanding about pixels per inch (PPI) and what is enough resolution to make a good print. Here is a simple guide to help make it clearer.

Resolution

Ultimately our goal is to get as much detail or resolution in a digital image as possible. Resolution is defined as the ability to distinguish two points as separate objects rather than a single fuzzy dot. There are many factors that influence resolution.

- The number of pixels per inch (PPI)
- The quality of the lens and the sharpness of the focus.
- The stability of the camera.
- The image contrast. It is easier to resolve fine detail when there is more contrast between elements.
- Viewing distance. The further one is away from the image the less detail is visible.
- The surface of the medium. A gloss print can show more detail than a textured canvas.
- The amount of light illuminating the print. One can see more detail on a well-lit print than one that is dimly lit.

PPI

PPI stands for Pixels Per Inch. Pixels are the building blocks of a digital image. In a JPG or an 8-bit RGB Tiff image a pixel consists of three colors (red, green, and blue) and each of those colors has 256 possible shades. It is these pixels that form the digital image. The more pixels there are, the more potential resolution there is. Note the word “potential” resolution is used because it is possible to add pixels and not increase the resolution.

Dots per inch (DPI) – DPI is frequently confused with PPI. DPI is a printing term. Printers produce very small ink dots. Some printers, such as our Epson P20000, print at 2400x1200 DPI. This is a function of the printer not the digital file. A higher DPI can make the print look sharper, but only if there is enough resolution in the file to support it. The best way to think of this is that it takes many dots to form one pixel.

Note that there are three words in “pixels per inch”. It is “per inch”. When stating PPI you must state it a specific size. A 2,400 x 3,000 image is 300 PPI at

8x10. If it is enlarged to 16x20, the image is twice as large, so it is now only 150 PPI. At 32x40 it is only 75 PPI.

Viewing Distance

A comfortable viewing distance from a print is generally considered to be a distance equal to 1 to 2 times the diagonal. An 8x10 print would generally be viewed from 13 to 26 inches. Closer than 13 inches would feel uncomfortable to view the entire image and further than 26 inches would limit one’s ability to see detail. A viewing distance of 1.5 times the diagonal (20 inches) would be considered a normal viewing distance.

The distance one is from an image has a dramatic effect on his or her ability to resolve detail in an image. An 8x10 print is normally viewed at a close distance. To get good detail at that distance requires a high PPI. However, when viewing a billboard, it is often several hundred feet away. Since it is so far away, the billboard does not require nearly as high of a PPI to look sharp. Larger prints viewed at a greater distance do not require as many PPI as smaller prints.

How many PPI are needed?

There is no magic answer to this. It depends on the subject matter, and how demanding the viewer is. The following chart can be used as a guideline. For most cases we recommend the mid PPI on the chart. PPI higher than the max will not result in any apparent resolution increase. PPI between the recommended and the minimum may show some difference, but most people will not notice. Using a PPI below the minimum is not recommended as it is going to show a definite decrease in sharpness. Please note the viewing distances for these print sizes. When viewing a large print at a short viewing distance, it will not look sharp.

Photoshop & PPI

Photoshop can do a lot of things to make images look better, but there are limitations. When increasing the PPI by using “resample”, it adds more pixels, but does not change the resolution. It may make the image appear smoother and less pixelated, but it will

not add more detail or make it look sharper. The chart below is based on the PPI of the original file, not PPI after it has been resized in Photoshop.

Sharpening

Sharpening done properly can make an image look sharper and improve edge definition. Sharpening puts a white halo around darker parts of the image which

makes it seem sharper to the eye. There is tendency for people to overdo sharpening and create an artificial look. When sharpening an image do all the other edits on the file first. Sharpening should be the last step in your process. Then when sharpening look at a magnified area of the image to see how much sharpening can be done before it starts to detract from the image.

Print Size	Image Diagonal	View Distance in Feet			PPI			TIFF File Size		
		Min	Mid	Max	Max	Mid	Min	Max	Mid	Min
8x10	13	1.1	1.6	2.1	300	200	150	21	9	5
11x14	18	1.5	2.2	3.0	300	200	150	40	18	10
16x20	26	2.1	3.2	4.3	300	200	125	82	37	14
20x24	31	2.6	3.9	5.2	200	150	100	55	31	14
24x30	38	3.2	4.8	6.4	200	150	100	82	46	21
30x40	50	4.2	6.3	8.3	200	100	100	137	34	34
40x60	72	6.0	9.0	12.0	150	100	90	154	69	56
48x72	87	7.2	10.8	14.4	150	100	80	222	99	63
60x90	108	9.0	13.5	18.0	125	100	70	241	154	76
90x135	162	13.5	20.3	27.0	100	80	40	348	222	56