Adobe® Photoshop CS®2

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Image Size - Common Questions

What is the relationship between mega pixels, file size, image size, and print size?

Here are some examples using some of the most current cameras on the market:

Mega pixel	File size (8bit, RGB)	Pixels	Example	Print dimensions (at 300 ppi)
4.1	11.5 mb	2464 x 1632	Nikon D2Hs	8.213 x 5.44 in
8	34.7	3456 x 2304	Canon Digital Rebel XT	11.52 x 7.68 in
12.34	34.7	4256 x 2848	Fuji Fine Pix 3	14.187 x 9.493 in
12.4	34.9	4288 x 2848	Nikon D2X	14.293 x 9.493 in
16.7	47.5	4992 x 3328	Canon EOS 1Ds Mark II	16.64 x 11.093 in
22	62.2	5356 x 4056	Leaf Valeo 22Wi	17.853 x 13.52 in
22	65.1	5488 x 4145	Phase One P 25	18.293 x 13.817 in

Mega Pixels - The "mega pixel" count is calculated by taking the total number of pixels across and multiplying them with the number of pixels down. But you might notice that if you do this, the numbers don't exactly match up. That's because some camera manufacturers quote the entire sensor size when realistically there is typically a slightly smaller "effective imaging area" that is only truly reliable in creating the final image. The bottom line is that this calculation will get you in the ballpark for some cameras, and right on for others.

File Size - I calculated the file size (above) in the "New" dialog box in Photoshop by entering the width and height (in pixels), as well as the bit depth and color mode (8 bit, RGB for the examples above). This is the file size while the image is open in Photoshop. When it's saved to disk, this size might change (generally it will be smaller) depending on the file format used as well as the contents of the image. Adding additional layers typically creates a larger file size on disk. Most file formats (such PSD, TIF and PDF) compress without discarding any of the original information ("lossless" compression) while others such as JPEG discard information which can not be recovered (known as a "lossy" compression algorithm). You will notice that images with large areas of the same color will be smaller on disk than those images that change color dramatically or have a great deal of detail throughout the image.

Image Size - This is typically a catch-all phrase that isn't specific enough to define anything, but I think of it as the dimensions of the image in pixels.

Print Dimensions - I calculated the print dimensions (above) by opening an image at the specific pixel dimensions of the camera using the "New" dialog and then, in the "Image Size" dialog box in Photoshop, unchecking the "Resample Image" option, and setting the resolution to 300ppi.

Don't forget, not all capture devices are created equal. These images are all interpolated (because each sensor can only measure red, green, or blue pixels). But it's not all about file size. There are many factors that you should consider when choosing a camera. And don't forget that digital images (because they lack the grain that film has) can be resized to a greater degree without noticeable loss of image quality. The size of each individual sensor also plays a huge factor in the quality of the resulting image. Some of the larger format camera backs are close in the total pixel count to their 35 mm counterparts, but because of the increased size of each sensor, they're more accurate and less prone to noise.

How do I figure out how at what size to scan?

The easiest way to calculate how large of an image you need to scan is to use the built-in function of your scanner (if it has one). Every scanner is different, but most of them give you the ability to select an area (some will even let you define the area or constrain the selection to a defined aspect ratio) and will calculate the resulting file size for you. Some will even show you the resulting size at a user defined resolution. But if you're not so lucky, then the best thing for you to do is to "cheat" by using Photoshop's "New" dialog box as a calculator. Before scanning, decide at what size you will be printing the image. Then select File > New and enter the desired width,
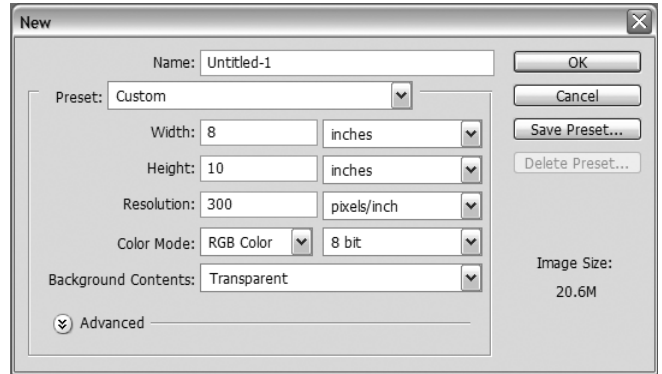
height, resolution, color mode, and bit depth that you will be working with. This will calculate the size for you and display it on the right side of the dialog. Then set the parameters of your scanner to scan that size (or close to it). This is easiest if you are going to use the entire scanned image without cropping. However, most of the time, you are either going to crop the image because you only want to use a part of it, or you are going to need to crop it because the original doesn't match your intended aspect ratio. Regardless, when you are using your scanning software, there should be an option that allows you to select an area (hopefully it even lets you select an area based on a constrained aspect ratio) and will calculate the resulting file size. Please don't forget to take into account the bit depth and color mode in which you are scanning. Those gray scale files will be only a third the size of their RGB counterparts, and those 8 bit images are only 1/2 the size of their 16 bit equivalents.

What resolution (ppi) should I send to my ink jet printer?

The majority of people that I speak with are happy printing their images to their ink jet printers at between 240 and 360 ppi. I believe that you will likely be able to tell the difference between 240 and 300 ppi, but it will be significantly more difficult to notice the difference between 300 and 360 ppi (without using a loop). The best advice that I can give you is to print the same document at 240ppi, 300ppi and 360ppi, and choose the best quality at the lowest resolution.

Remember, there is a trade-off when increasing your ppi count. For example, I typically print my images at 24 x 24 inches, 300 ppi in 8-bit RGB. If the file is flat, it's just under 150 mb. Although I would like to increase the resolution to 360 ppi for maximum quality, that would give me a file size of just under 215 mb. Although that may not sound too large for some of you, realize that my work typically includes 15-20 layers which would get me in the 1.5-2 gig file size for layered files. With current technology, that makes my creative work come to a grinding halt!

Keep in mind that if you are printing small images, then people will be looking at them up close and you will want to include that extra resolution if you can. As you print larger sizes, the viewing distance also increases allowing you to print at a lower ppi.

If you're printing to glossy paper, you 're going to need a higher resolution than you might if you're printing to a fine art, watercolor, matte paper – this is because matte paper is more absorbent and viewers are more forgiving of "softer" images on those papers.

What resolution do I need to send my images to the printing press?

Generally speaking you'll want 1.5 - 2 times the line screen (lpi) in pixels per inch (ppi). However, it is always best if you speak with the printing professionals that are going to be printing your job. If for some reason they're not available (in which case I might think about switching printers!), use the following guidelines to help you choose your resolution. If you choose the lower end of the range, you will have a smaller file size but the quality might not be as high. Here are some typical examples of publications:

Newspaper Ad	(65-85 lpi)	130 - 170 ppi
Average Magazine & Brochure	(133 lpi)	200 - 266 ppi
High End Magazine & Brochure	(150 lpi)	225 - 300 ppi
Annual Report	(177 lpi)	265 - 350 ppi
Fine Art & Coffee Table Books	(200 lpi)	300 - 400 ppi

You will need to talk to your printer (see that communication is so important!) to get more specific information about the print job such as – inks,

dot gain, paper, separation type, maximum ink limits etc. However, if you're new to the prepress industry, it's strongly recommended that you hand your printer RGB files rather than CMYK. They will have a much better idea about the optimum conversion settings from RGB to CMYK.

How large should I save an image when creating a slide show on my computer?

This will depend a bit on your output device. In other words, will you be displaying the slide show on your computer monitor (in which case the optimum dimensions could be 1024x768, 1280x1024, or even 1600x1280), or if you'll be displaying them through a projector. Most newer projectors have a native resolution of 1024 x 768, some are even at 1280x1024 though these tend to be substantially more expensive. If you create a template that matches the native dimensions of your monitor or projector, and fit all of your images within those dimensions, you should be set. If you are going to use another application like Adobe Premiere Pro to create a slide show, then you may want to leave your images larger in case you decide to pan and zoom across them. Premiere will take care of resizing them to the proper dimensions.

What resolution should I use to post my images on my web site?

First of all, if you're going to post your images to the web, you shouldn't worry about the resolution of the image – focus instead on the total pixel count. You're going to want to limit the image to dimension of 740 pixels square with most images at a much lower count of 200-400 pixels. You have to know your audience. Are they a "captive" audience –waiting to sign off on an image, or are they simply browsing your portfolio? Factors such as that will determine their attention span for download times. This is the reasoning behind using small thumbnails to capture the viewers interest, and then link those to larger images which can be displayed on demand. Typically the small thumbnails range from 50 - 75 pixels and the large gallery images from 300 - 600. Of course the trade off is between files size and image quality. Personally, I would rather have a viewer see a higher quality image that is a bit smaller then go for the larger size of lesser quality.

Another important ingredient here isn't just image dimensions, but compression settings. 99% of the images you post to the web will be in JPEG format, and a 740x740 pixel JPEG can be 80k, or it can be 2 megabytes in size. Once again, you're trading file size for image quality.

Printing using an online service

The online service should know at what resolution they want your file as well as what format they prefer, the color space to work in, and if you should sharpen the file. My best advice is to go with what they say and see if the results match your expectations for quality. Most imaging devices that expose photographic paper such as the Cymbolic Sciences Light Jet, Durst Lamda and/or the Fuji Frontier systems allow you to get away with fewer pixels per inch because they are "continuous tone" devices.