



▼ Dave Cross



Beginners' Workshop

Pixels and Resolution and Image Size, Oh My!

Resolution and image size have the potential to be among the most confusing topics in Photoshop. How big should I make it? What resolution should I use for printing? What's the best way to resize my image? This column will attempt to shed a little light on these questions.

The first thing we need to agree on here is to approach the topic of resolution based on the final output of the document: onscreen or print; and if print, is it inkjet or commercial printing? The reason for making these distinctions is that it's a whole lot simpler to talk about resolution with the artwork's destination in mind.

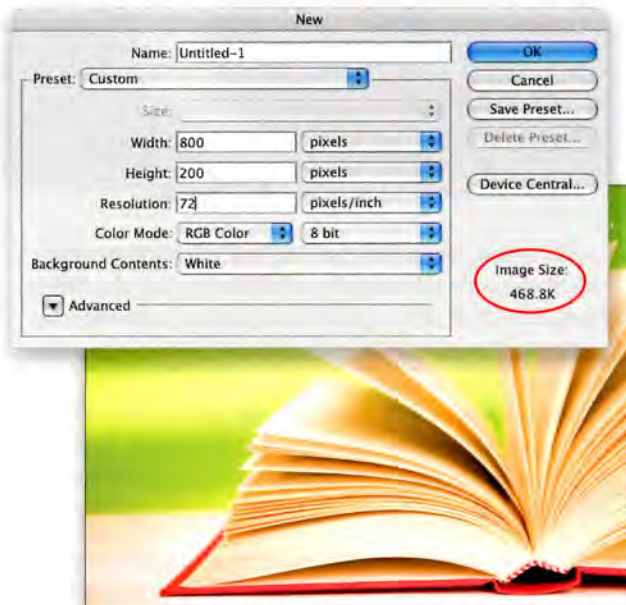
For example, you've probably read discussions about the ideal pixels per inch (ppi) or dots per inch (dpi) to use when printing. But when we're talking about images being used onscreen (Web, presentations, video, or slide shows), you can take those factors right out of the conversation (more on printing, ppi, and dpi later).

Think about pixel dimensions

The simplest way to think about resolution for onscreen use is by pixel dimensions. For example, if I want my PowerPoint presentation to look good on my monitor, and my monitor is set to a resolution of 1024x768 pixels, then that's an ideal size for photos that I want to be seen full screen. And, if I need an image to fill only a portion of a slide, then I would create it at a smaller size, using 1024x768 as my guideline.

Just to prove a point, try this: Imagine that you've been asked to make a banner with the dimensions of 800x200 pixels for a webpage. Go up to the File menu and choose New. In the New dialog, enter a Width of 800 pixels, a Height of 200 pixels, and a Resolution of 72 pixels/inch. The bottom-right corner of the New dialog indicates that this will create a file size of 468.8K.

Now, change the Resolution to 300 and notice that the file size doesn't change.



Both files would look the same in Photoshop and would display at the same size on a webpage. If you checked the size of each document through the Image Size dialog (Image>Image Size), the difference would be in the Document Size section, which can be thought of as the printing size; however, we're not printing this graphic so the resolution is irrelevant.

Therefore, if you know that you're preparing a graphic for onscreen use, think pixel size and everything will be simpler. It's interesting to note that many commercial labs that print photographs are starting to talk pixel dimensions too: It's much simpler to tell a customer to submit a file that's 2000x2500 pixels when printing an 8x10" print. Images come from our camera expressed in pixel dimensions, so why not continue to speak the same language when preparing to send images to a lab?

Here's what I mean: If you open a file shot in RAW format with a 10-megapixel camera, when you open it in Adobe Camera Raw, the image size is expressed in terms of pixel dimension—2592x3872. Once again, the resolution setting (this time in the Camera Raw Workflow Options dialog) is only relevant to the resolution you'd use for printing. *Note:* Click on the blue hyperlink to the right of Save Image at the bottom of the Camera Raw window to open this dialog.

1024 by 1530 (1.6 MP) -
1371 by 2048 (2.8 MP) -
2056 by 3072 (6.3 MP) -
✓ 2592 by 3872 (10.0 MP)
2742 by 4096 (11.2 MP) +
3427 by 5120 (17.5 MP) +
4113 by 6144 (25.3 MP) +

Say you plan to send this image to your favorite lab, then check their website to see how large you can print it without losing quality. As long as your native pixel dimensions are equal to or larger than their minimum requirements, you're good to go.

Last stop: printing

In the world of printing, we need to distinguish between printing on our own inkjet or laser printers and printing at a commercial printer (brochures, magazines, etc.) or photo lab. As we discussed earlier, check with the photo lab to find out what size requirements they have and send in your photo at an appropriate size. Commercial printers will talk resolution—typically, 266–300 ppi for high-quality printing at the final size. In other words, if you plan to print an 8x10" photo in a brochure, it should be 8x10" at 300 ppi.

Inkjet printers can be even more confusing, as they're described as a 1440-dpi (or some other dpi) printer. "Dots per inch" (dpi) is a term that indicates the quality that the printer is capable of printing, but it's not an indicator of the ppi we should use. Many people find that a resolution of 240 ppi is more than enough for a great quality print on most inkjet printers. How do you know for sure? Although it will take a little paper and ink, I'd suggest running a test: Take a 5x7" photo and print it on your inkjet at 300 ppi. Then use the Image Size dialog (Image>Image Size) to lower the resolution to 240 ppi, and print that. (See "Resampling in Image Size" for more information on resizing an image.) Now, use the Image Size dialog to lower the resolution to 200 ppi, and print that one. Try printing a series of photos at resolutions as low as 120 ppi and see if there's any noticeable difference—chances are, there won't be a huge difference.



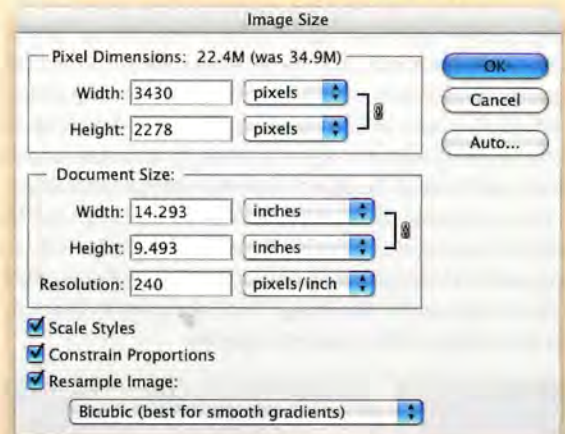
All this suggests is that although 240 ppi is the ideal resolution to use, if you have a photo that doesn't contain enough pixel information to print at 240 ppi, in a pinch you might be able to get away with a lower resolution.

One final piece of advice: It's easier to decrease the resolution rather than increase it—and there will be less chance of quality loss. So if you're not sure how "big" to capture a file or how large a setting to use in Camera Raw, err on the side of "too big," because you can always make it smaller without losing quality.

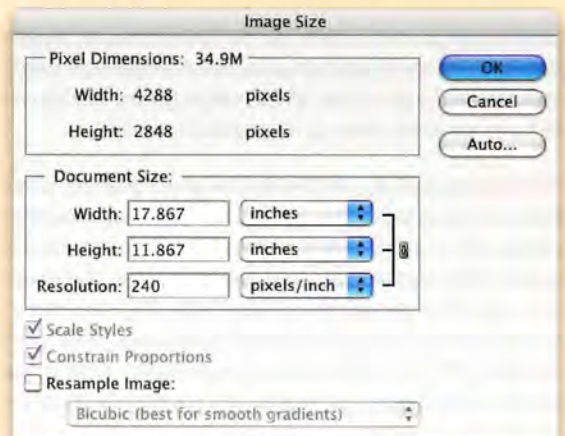
RESAMPLING IN IMAGE SIZE

One of the biggest sources of confusion in the Image Size dialog is the Resample Image checkbox. Here's the way to decide whether to check or uncheck that box:

- If you want to lower the resolution (ppi) of a file *without changing its width and height*, check the Resample Image box. This will also result in a smaller document size, as indicated at the top of the dialog. This is what you use to decrease the resolution for printing on your inkjet.



- If you want to lower the resolution *and change the width and height*, uncheck Resample Image. This means that if you lower the resolution, the width and height will increase in size. This is a very useful way to check how large you can print a document: Set the resolution to 240 ppi for your inkjet and you'll see the maximum width and height you can print. ■



If you have an idea for a "Beginners' Workshop" topic, please send it to letters@photoshopper.com; however, if you have a question that you'd like answered immediately, go to the Help Desk at www.photoshopper.com.

The (Pixel) Size is the Thing

One of the most potentially confusing concepts in Photoshop is changing the size of a document—especially when using the Image Size dialog. Resize Pixel Dimensions or Document Size? Resolution? Resample Image or not? If so, how? Bicubic? Bilinear? In this article, we'll attempt to demystify this dialog's inner workings.

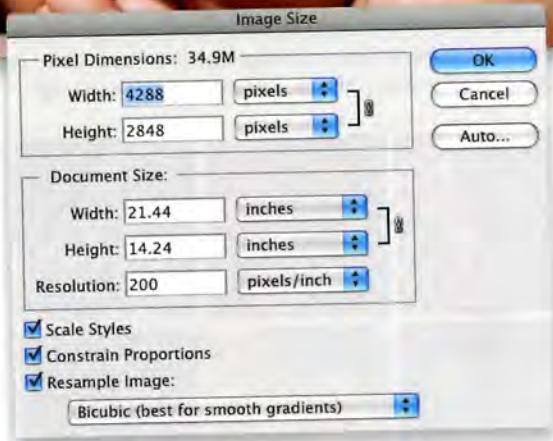
First, let's clear up some puzzling terminology: resizing vs. resampling. When you resize a document in Photoshop, you're not making it physically bigger or smaller—that's what resampling does.

In Photoshop, *resizing* means taking the existing pixels and playing with the numbers to change the *quality* of the image—the dimensions stay the same. To scale an image and make it smaller or bigger, we *resample* the image: Change the number of pixels in a document and therefore its dimensions. More on this as we go through the options in the Image Size dialog.

When you first open an image and look at the Image Size dialog (Image>Image Size or press Command-Option-I [PC: Ctrl-Alt-I]), you're presented with a couple of different ways of looking at the size. As we'll see, the method you use depends on what you're doing with your document.



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Understanding Pixel Dimensions

In the Image Size dialog the Width and Height are shown in pixels by default. If you're working with a photo captured by your camera or from Adobe Camera Raw, the dimensions are

established by the camera's quality setting or by the settings you choose in the Workflow Options dialog in Camera Raw (accessed by clicking the blue hyperlink under the image).

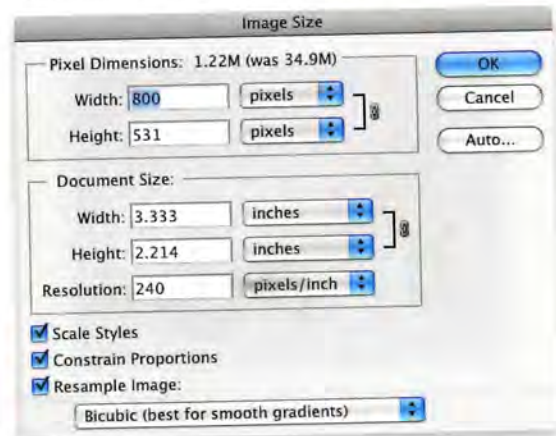


Note that the document (file) size is also shown in the Image Size dialog—in our example 34.9 MB—which can often be a useful indicator of image size, as we'll see later.

By default, the Width and Height are linked together (because the Constrain Proportions box is checked on) so that if you change one measurement, the other changes proportionally. Typically, this setting is left on—unless you're going for the squished or stretched look.

In general, we use Pixel Dimensions to choose the size of a document when preparing images for the Web, for video, and even when sending to a commercial lab for printing. For example, at www.Mpix.com, they recommend the ideal file size for printing as follows: a 16x20" should have dimensions of 4000x5000 pixels, with the minimum dimensions being 2000x3000 pixels. Nowhere is resolution discussed. In effect what Mpix is saying is that as long as you give them "this many" pixels for "this many" inches, then your print will look great.

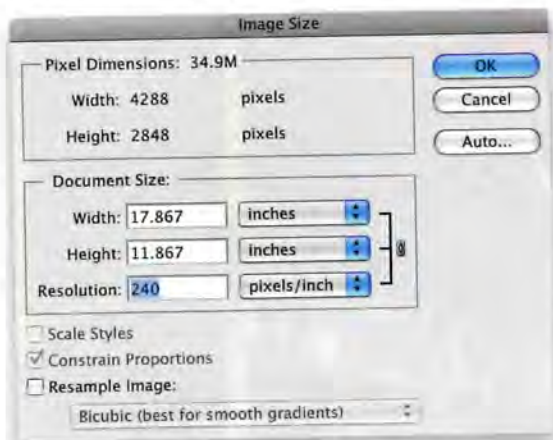
In practice, if you want to change the document width from 4288 pixels to 800 pixels, you enter 800 in the Width field and the document is resampled to that new pixel width.



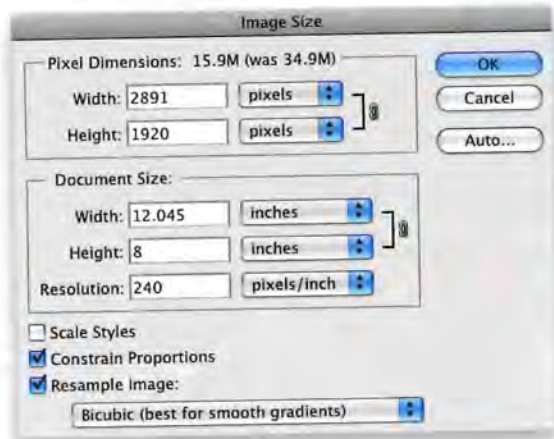
Working with Document Size

In the Document Size section of the Image Size dialog, we see Width, Height, and Resolution, with inches as the default unit of measure (set in Photoshop [PC: Edit]> Preferences>Units & Rulers). Generally, this is useful when you're printing to your own printer and you know the resolution that works well for your device, or you're preparing a file to be placed into page-layout software to be printed at a specific size and resolution. Here's an example:

In Image Size, our photo is 21.44x14.24 inches at a Resolution of 200 pixels/inch (the Resolution is based on the choice made above in the Camera Raw Workflow Options). Because I use 240 pixels/inch for printing to my inkjet printer, I'll change the Resolution to match and uncheck the Resample Image box. Notice how the chain now links all three values—Width, Height, and Resolution—and the Pixel Dimensions section at the top can no longer be edited. What this means is that I'm keeping the pixel size of 4288x2848 and just "re-distributing" (resizing) the pixels to fit a new resolution. When I enter a value of 240 into the Resolution field, Image Size does the math, letting me know that I can print a page as large as 17.867x11.867 inches.



For the sake of argument, let's say that we want to print an 8x10". When we changed the Resolution to 240 pixels/inch, the document ended up larger than we need. So, if we click the Resample Image checkbox, we can alter the Pixel Dimensions by changing the Width and Height fields in the Document Size section of the dialog. Now, change the Height to 8 inches



and see what happens: the Width changes to 12.045 inches, the Resolution stays at 240, the Pixel Dimensions change to 2891x1920 pixels and the file size drops to 15.9 MB. Before doing anything else, I'd use Save As to create an 8x12" version, while *preserving* the original, larger photo.

Now, to print an 8x10", you'd have to determine which 2.046 inches to exclude using the Crop tool (C). In the Options Bar, enter 10 inches for Width, 8 inches for Height, click-and-drag the cursor across the image to crop to the portion of the image that you want to keep, and press Return (PC: Enter) to crop the image to an 8x10".



Using the Resample menu

When you resample a document, either making it smaller (hopefully) or larger (as infrequently as possible), the Resample drop-down menu can help you get a better-quality end result. Depending on how you're resizing the image and the type of image with which you're working, there are several choices in the menu: Nearest Neighbor (Preserve Hard Edges), Bilinear, Bicubic (Best for Smooth Gradients), Bicubic Smoother (Best for Enlargement), and Bicubic Sharper (Best for Reduction).

Note: The two latest versions of Photoshop have included a brief description of what the commonly used methods are best used for: Bicubic Sharper, for example, includes "best for reduction" next to its name in the Resample menu. Choose from this menu depending on whether you're "downsampling" (scaling down) or "upsampling" (scaling up).





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Original



Upsampled 110%



Upsampled 125%

What about making a document physically larger? Is it possible? Yes. Advisable? No. Using Image Size to make a document larger means that pixels have to be artificially added into the Pixel Dimensions and, as you can imagine, the more “fake” pixels that are added, the more details are lost. So while it’s technically possible to enter a larger value, the results won’t be very good when you make a document larger. Some people would argue that if you’re only enlarging 10–20%, the results are “not too bad.” What I’d say is “Enlarging 10–20% means you won’t notice the fake pixels quite as much as if you enlarged it 25% or more.”

Adjust Pixel Dimensions or Document Size?

Like many things in Photoshop, for the question, “Which one should I use: Pixel Dimensions or Document Size?” the answer is, “It depends.” For example:

- If you’re scaling down an image for the Web or to email to someone, use Pixel Dimensions to quickly change to a smaller size and then use File>Save As to save a copy.
- If you’re preparing an image for printing and you need a specific resolution, then Document Size is the way to go.

And don’t be afraid to experiment inside the Image Size dialog—you can always click Cancel. Or try this: press-and-hold Option (PC: Alt) and the Cancel button will change to Reset so that you can change the numbers back to square one and try something else.

Just remember that whenever possible, you should start with a large document and make it smaller, rather than the other way around. So capture images with your camera at the largest size possible or create new documents at the largest size you think you’ll need. You’ll always get better quality by scaling a document down rather than scaling larger. ■

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