Resizing Images Using Photoshop or Photoshop Elements
By Thomas Zinneman

One can resize images using several different methods with Adobe's Photoshop or Photoshop Elements. To obtain the best results when using these methods, one should have a good grasp of the concepts behind each method of resizing.

Digital image size

Digital images are collections of pixels (short for picture elements) arranged in a rectangular grid.   They can be created using an electronic device, such as a scanner or digital camera, or they can be generated using a software program. The size of a digital image can be specified in one of two ways: by its dimensions in pixels or by the total number of pixels it contains. For example, an image can be said to have 2592 x 1944 pixels or it contains 5 Mpixels (2592 multiplied by 1944). By convention, image size is specified as the width x height. Following are several common digital camera image sizes:

<div align="center">

2 Mpixels – 1600 x 1200 pixels   (4:3 aspect ratio)
5 Mpixels – 2592 x 1944 pixels   (4:3 aspect ratio)
10 Mpixels – 3648 x 2736 pixels   (4:3 aspect ratio)
15 Mpixels – 4752 x 3168 pixels   (3:2 aspect ratio)
18 Mpixels – 5184 x 3456 pixels   (3:2 aspect ratio)

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Monitor screen size

The size of images on a monitor's screen is different from the size of printed images. A monitor, whether it's a CRT or LCD, has several different screen sizes (also referred to as resolution) available for displaying information. The physical size of the monitor's screen in combination with the graphics adapter card in the computer determines the screen sizes that are available. For example, a 17-inch monitor usually has the following screen sizes available: 640x480 pixels, 800x600 pixels, 1024x768 pixels, and 1280x1024 pixels. Note that the screen size is measured in pixels, not inches. If the monitor is set to 1024x768 pixels, the monitor's screen will be 1024 pixels across by 768 pixels high. If one does a lot of image editing, it is best to use the largest screen size available with your monitor. This allows more of the actual pixels of an image to be displayed.

To determine your monitor's screen size, select *Start>Control Panel> Personalize>Display settings*. You should see the following dialog box.
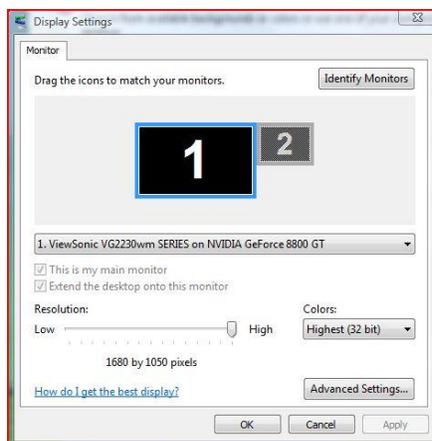
The screen size is shown underneath the slider bar in the lower left corner. One can change the screen size by moving the slider with the mouse.

Note that the available screen sizes are usually much smaller than the images obtained from a digital camera. For example, the typical image size generated by a 10-Mpixel camera is 3648 x 2736 pixels. Thus, the image is too large to be viewed full size on the monitor's screen. Fortunately, most image viewing or editing programs automatically resize the image so all of it can be viewed on the screen.

Digital projectors have a fixed screen size, such as 1024 x 768 pixels, 1280 x 800 pixels, or 1920 x 1080 pixels.

Image Size dialog box

To resize an image, open the *Image Size* dialog box. In Photoshop or Photoshop Elements, open a sample image. From the menu bar, select *Image > Image Size* (In Photoshop Elements, select *Image >Resize> Image Size*) and the following dialog box will appear.
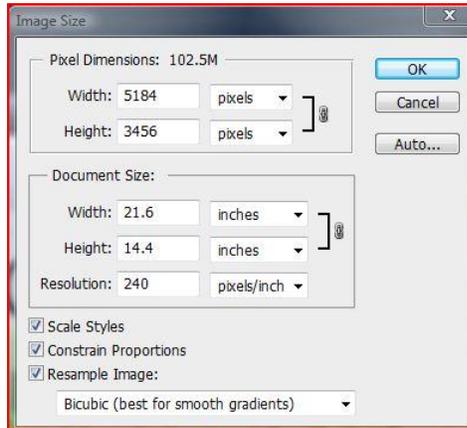
When you use the above dialog box to resize your images, four aspects of your image can change:

a. The pixel dimensions, which is the width and height of the image in pixels and is shown in the Pixel Dimensions section.
b. The file size of the image, also shown in the Pixel Dimensions section.
c. The physical size of the image, in width and height, when printed, which is shown in the Document Size section.
d. The resolution of the image when printed, which is the number of pixels per inch or centimeter, also shown in the Document Size section.

The Image Size dialog box allows you to resize your images in two ways: by increasing or decreasing the amount of data in the image (resampling) or by maintaining the same amount of data in the image (no resampling). When you resample an image, the quality of the image may degrade to some extent due to interpolation (creating, adding or deleting pixels). You may have to sharpen your image afterwards to compensate for this degradation.

Resizing images without resampling

Resizing without resampling changes the physical size of a printed image, but does not change the pixel dimensions of the image. **No data is added or removed from the image.** When you uncheck, or turn off, *Resample Image*, the pixel dimension fields are not available, and the only two values you can change are the physical size (width and height) or the resolution (pixels/inch). Note: One should keep the *Constrain Proportions* checked to maintain the image aspect ratio.
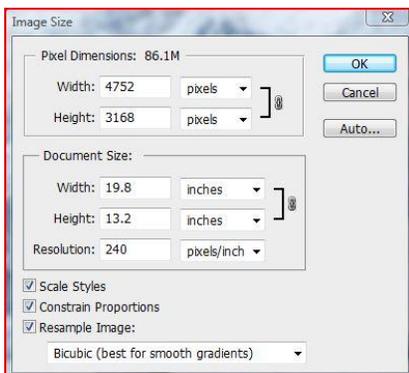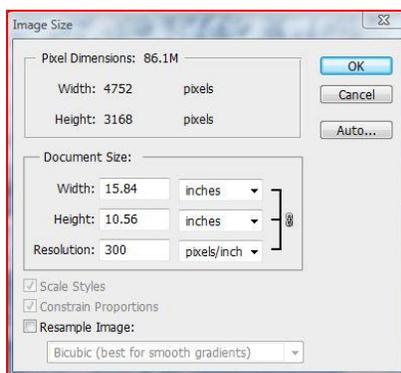
(default setting)   (change resolution)   (change width)
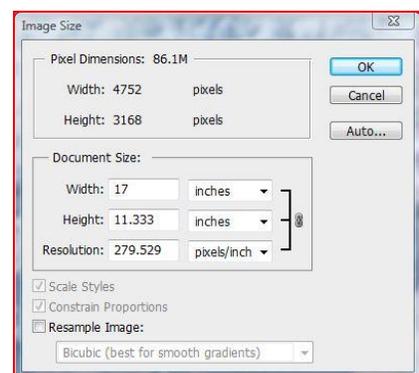
Resizing images with resampling

When you resize an image by resampling it, you change the amount of data in that image. To resample your image, ensure that *Resample Image* is checked. Resample is on by default. Resampling changes the total number of pixels in the image, which are displayed as the Width and Height in pixels in the Pixel Dimension section. When you increase the number of pixels (upsampling), the program adds data to the image, and when you decrease the number of pixels (downsampling), the program removes data. Whenever data is added to or removed from the image, the image quality degrades to some extent. Removal of data from the image (downsampling) is usually preferable to adding data (upsampling). This is because it is a more complex procedure to create new pixels than to remove existing pixels.

When resampling is turned on, you can change any or all of the three values in the Image Size dialog box: pixel dimensions, physical size, or resolution. Changing one value will affect the others; the pixel dimensions will always be affected.

   If you change the pixel dimensions, the physical size will be affected, but not the resolution.

   If you change the resolution, then the pixel dimensions will be affected, but not the physical size.

   If you change the physical size, then you will change the pixel dimensions, but not the resolution.
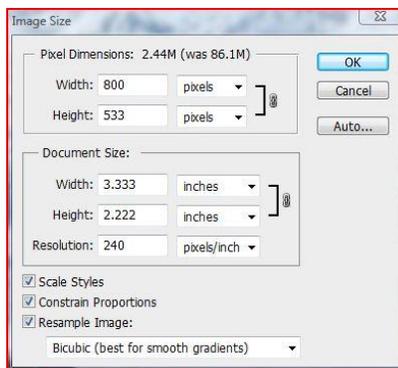
| (changing pixel dimensions) | (changing resolution) | (changing physical size) |
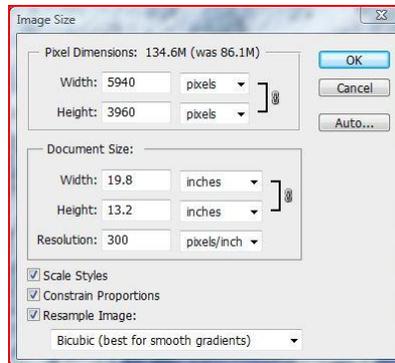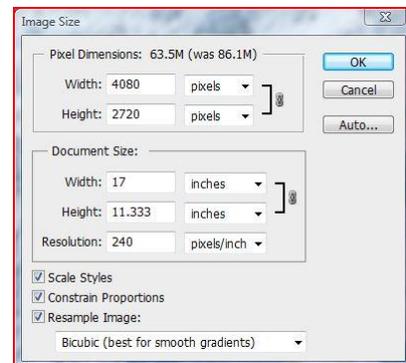
Note how the file size changes as the pixel dimensions are changed. Also note that holding the Alt key down changes the *Cancel* command in the dialog box to *Reset*, thus enabling you to quickly return to the original settings if you want to.

Located near the center bottom is the interpolation method. The default method is *Bicubic*, which is a very good method and can be used in most cases. When the down arrow is selected, several other methods are presented. Adobe recommends using the *Bicubic Smoother* method when enlarging images and the *Bicubic Sharper* method when reducing the image size. For really big enlargements, such as 4 or 5 times larger than the original, you might want to use a program such as Alien Skin Software's Blow Up or Genuine Fractals.

Changing the aspect ratio of an image

The Image Size command cannot be used to change the aspect ratio of an image (as long as the *Constrain Proportions* box is checked). The aspect ratio is the ratio of the image height to the image width. The aspect ratio of most compact digital cameras is 4:3; that of SLR cameras is 3:2. Thus, if you want to make an 8x10-inch print, you will have to change the aspect ratio of the image. This may be done using the Crop tool or the Rectangular Marquee selection tool with the Crop command.

When using the crop tool, the options bar contains a box with the crop symbol (Photoshop) or labeled *Aspect Ratio*. (Photoshop Elements). When you click on the down arrow, several common aspect ratios in inches appear. In the following example, the 8 x 10 inches option was chosen.
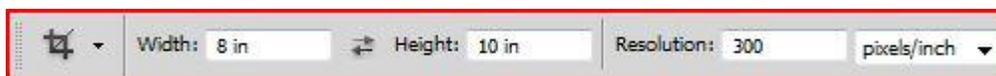
If the size you want isn't available, you can enter the *Width* and *Height* in the appropriate boxes. Be sure to enter *in* for inches or *px* for pixels after each number. Don't forget to enter the *Resolution*, if you're planning to print.
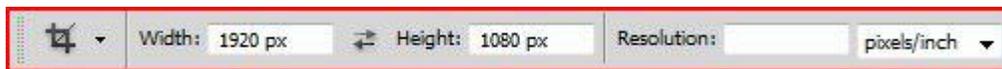
If the image is for viewing on a screen (web or e-mail), just enter the required image size in pixels and leave the *Resolution* box blank. If you want to do a free form crop, leave all of the boxes blank.

One can also use the Rectangular Marquee tool for cropping at a specific aspect ratio. In the Options bar, select Fixed Ratio in the *Style* dropdown menu. Then type in the width and height numbers. Do not add inches or pixels, as the aspect ratio is a dimensionless number.
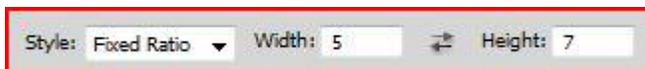
After filling in the appropriate numbers, draw a rectangle around the area you want to keep. Then select *Image > Crop* from the menu bar. Use the Image Size dialog box (*Image > Size > Image Size*) to set your resolution and document size for printing.

Optimal Settings for Printing

When we talk about image resolution, we are referring to the number of pixels per inch (ppi). When discussing printer resolution, we typically see numbers like 1200, 1440, 2400, or 2880 dots per inch (dpi). Note that ppi is not the same as dpi. When printing, multiple dots are used to create the color of one pixel.

The print engine of a printer is designed to work with an optimum image resolution. For Epson printers, the optimal setting is 360 ppi. You will also get good results using a fraction of this setting, like 300 ppi, 240 ppi, or 180 ppi. For HP and Canon printers, the optimum image resolution is 300 ppi. Again, you can use fractions of this size, such as 240 ppi or 180 ppi. Lower numbers work okay for larger images because the viewing distance for a large print is usually greater than that for a small print.

There is an article by Jon Canfield called *The DPI Myth* in the March, 2007 issue of Shutterbug where he discusses the optimal settings for printing. The following data is taken from that article.

Print Size	PPI Setting in Image Dialog Box
8x10 and smaller	360 ppi (Epson) or 300 ppi (Canon & HP)
11x14	300 ppi
13x19 or 16x20	240 ppi
24x36	180 ppi