

### ***This document defines resolution and ways to calculate appropriate image resolution***

**Resolution** refers to the number of pixels (or picture elements) needed to display pixel-based images. The term resolution can be confusing because it is used in three different ways:

**Screen Resolution** – is the number of pixels needed to create a screen image. It is **always** 72 pixels per inch on a Macintosh. Since the web is viewed from a screen, web resolution is also 72 pixels per inch.

**Print Resolution** – is the number of dots a particular printing device is capable of producing in a linear inch. Print resolution **varies** amongst devices. To further complicate matters, laser printers do not produce overlapping dots but inkjet printing resolutions are often reported in overlapping dots.

**Image Resolution** – is the number of pixels needed to accurately reproduce an image on a particular output device. Therefore, in order to calculate the number of pixels needed for an image, it is necessary to know how the image will be used. Further, since image resolution is measured specifically in terms of dimensions, it is also necessary to know the output size of an image when calculating appropriate resolution

Note that screen resolution can be much lower than print resolution, meaning that when actual size is displayed on screen not all the pixels that are in the file are viewable onscreen. This partially explains why an image can appear different on a screen from the way it appears when printed.

### ***Some examples of image use, size consideration and appropriate Image Resolution***

<b>Image</b>	<b>Size Consideration</b>	<b>To achieve correct image Resolution</b>
Photograph	Used at actual size	Scan at 72 pixels per inch, 100% scale
Slide, actual size 1" x .8"	Needed 5" x 4" for medium res. press	Scan at 300 ppi (appropriate res. for a press) at 500% size.
Line Art Drawing, 5" x 7" Line Art Drawing	Needed 200% size	Scan at 600 ppi, at 200% size.
4 megapixel digital image	Need 4 x 6 photo for med. res. press	Use Photoshop to INTERPOLATE the pixel data to achieve the right resolution.

### **Guides to Calculating Image Resolution**

Figure out the **ACTUAL SIZE** you will use the image. If you don't know, estimate the **LARGEST POSSIBLE** size the image might be used.

Figure out resolution needed, using the following guides:

Web Resolution 72 pixels per inch at actual size

Low to Medium Print Resolution      Line Art 600 ppi at actual size  
Grayscale or color information 300 ppi at actual size

High-Resolution Press      Have printing production personnel specify, scan at actual size.

**While the number of pixels in a pixel-based image can be manipulated with Photoshop or other image-editing programs, it is important to always remember:**

Adding pixels with an image editing program changes the actual image data, and tends to soften or blur original details.

Deleting pixels irrevocably throws away actual image data.

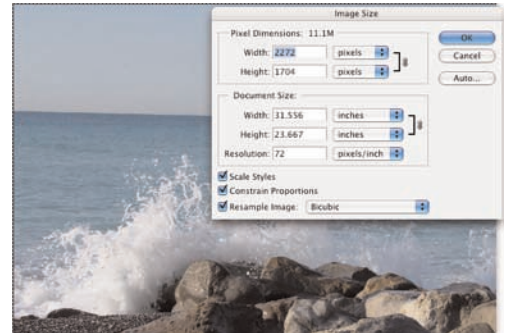
*continued on page 2*

### Interpolation – changing image size without adding or deleting pixels

Adobe Photoshop offers ways to adjust resolution without adding or deleting pixels, and thus changing actual image data. The **Image Size** option (in the Image Menu) allows viewing and adjusting of image size.

The example at top right shows a digital image file from a 4 megapixel digital camera. The file downloads from the camera as a 1.6 mb., JPG image at 72 ppi, with dimensions of approximately 32" x 24".

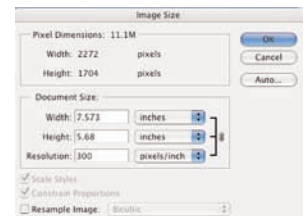
Notice the number of pixels in the top left example. Using Image Size feature, all the pixels can be redistributed so the image will be 300 ppi.



### Remember: there is an INVERSE relationship between size and resolution.

1. To adjust the resolution **without losing pixel data**, open Image Size (from the Image Menu).
2. Make sure that Resample Image is **NOT** checked in the bottom right corner.
3. Enter the desired resolution OR size. In this example, resolution was changed to 300 ppi. Notice that the dimensions were **automatically** adjusted at the same time.

Notice also that the number of pixels in the image remains precisely the same as the original



### Reducing resolution and size deletes pixel data.

If the original photo (shown at top left) were to be used on a web page, it would to be scaled to fit a web page. It's original dimensions are too large.

1. To resize an image **and delete pixel data**, open Image Size (from the Image Menu).
2. Make sure that Resample Image **is** checked in the bottom right corner.
3. Enter the desired resolution OR size. In this example, size and the resolution were both reduced.

Notice that the number of pixels **has also decreased**.



### Wise Practice

- Always work on a copy of your image file when making image manipulations
- Name your files in ways which help you identify size, resolution, file format.