



## **Hands-On Examples For Pixels and Megapixels, Oh My!**

The hands on exercises in this document require the three folders of example photos. They will make more sense if you first go through the explanations in **Pixels and Megapixels, Oh My!**.

There is a final exercise that you do in PhotoShop® or PhotoShop Elements®. If you do not have either of these applications, you still can understand the final exercise by looking at the included

Click the links to jump to these exercises:



**Lossy Compression: Save Only Once**



**GIF and JPEG: A Final Word About File Size**



**Megapixels Do Count: Using Part of a Photo**



**Copyright Information In PhotoShop®**

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## Overview of Examples

The following notes relate to the three folders of example photos. These demonstrate the topics about choosing which graphics format to use in an activity, lossy compression, and using part of a photo. In each section open the photos in any application that lets you zoom in to see a magnified view. Then follow the discussion to see the effects being demonstrated. You can open any photo in the Examples set to do the final exercise on copyright.

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### Lossy Compression: Save Only Once

Open the five files in the Lossy Compression folder. First I'll describe the five files and their graphic formats, and then we will zoom in and compare them.

1. Turtle Uncropped is the original photo as it comes from the camera. It's a JPEG, and is 1600 X 1200 pixels. The file size is about 1.2 MB. I took this photo from a distance, because I know that turtles are shy.

2. Turtle 1.bmp was cropped from Turtle Uncropped, and is 800 X 600 pixels. Because this camera could take a fairly high megapixel photo, this cropped version still has enough detail to look sharp. Good thing, too, because long before I could get close enough to take this photo directly, Mr. Turtle would have seen me and scooted into the water.

Because I saved this cropped version as a BMP file, the file size is now larger, at 1.5 MB. I won't use this one in an activity, but it's useful as a conserved version. The advantage is that if I wanted to make further editing changes, I can reopen Turtle 1.bmp and resave without losing any detail.

2. Turtle 2.jpg is a JPEG version of the cropped image, saved with a medium quality JPEG compression. When you save a JPEG file, it lets you choose from a range from 0 to 12 on quality. This one is 5, right in

the middle. Note the savings in file size, as this image is only 188 KB. This would be the version I would use in an activity.

If I needed a little more image quality, I could go back and open the BMP version and save from it a new JPEG version with a higher quality but larger file size. I saved Turtle 2A at the highest quality setting (12) for the JPEG compression. It's 540 KB vs 188 KB, still a fairly small file.

3. To create Turtle 3.jpg, I did what you should not do--open a JPEG file and save it again. In fact, I did that over and over, about 10 times. I also saved at a low quality compression.

### **A Closer Look**

At this point, you are wondering what the point is. They look about the same at 100%, don't they! But try zooming in on the turtle's head in each picture. This is the same as enlarging the picture, but we just see part of it. Immediately, you can see that under magnification, the turtle's head is sharper in the BMP version than in any of the JPEGs. This is the effect of the initial compression.

It's an old truth that you can't have everything, and you can see that we sacrifice a little detail in choosing a JPEG, even of high quality (2A) over a BMP file. However, we also save quite a bit in file size. Consider that this is one of probably 10 or more photos in an activity, so that savings per photo adds up. At the 100% view on the page, our compromise Turtle 2A JPEG and even the more condensed Turtle 2 JPEG still are of acceptable quality, so it's worth that detail loss.

### **Effect of Repeated Saves on JPEG**

Now continue zooming in on each photo. Notice that the edges of the turtle's head begin to get messier sooner in all the JPEG versions than in the BMP version. Turtle 3, though, is pretty messy even before we first zoom in. If we needed to enlarge this image in the activity even a

little bit, perhaps in an animation or zoom effect, that pixelated loss of detail would show. Yet this version is not much smaller in file size than the much better looking JPEGs that were saved only once.

### **In An Emergency**

However, even the worst Turtle3 JPEG is a nearly usable image, even though I resaved it as JPEG many times. Repeated JPEG compression results in a loss of detail, but certainly a very slow one. Choosing at least medium JPEG quality actually holds the quality of that first compression fairly well with a few repeated saves. So if you really, really cannot avoid opening a JPEG, editing, and resaving it, you're okay doing that once or twice, especially if it's medium to high quality JPEG. But don't get in the habit of doing that. Ideally, plan to edit the conservation copy (BMP or PSD) and recreate a JPEG version from it for best results.

### **The Ideal Working Strategy**

The lesson here is to keep your original photo file and make from it a cropped and edited version under a related name that you save in a conservative format such as .bmp, .psd, or .pct (Mac). Save a copy from that image as a medium to high quality JPEG to use on the activity page. If you decide you need further changes, either go back to the original or to the conservation edited copy. Resave the edited conservation copy with these changes, and then make a JPEG copy from it to replace the first JPEG. That way, the JPEG version is always one save only.

### **Saving a JPEG is NOT the Same as Copying a JPEG**

Let me clarify one thing here. It's opening and saving the JPEG that degrades it, not making a copy of the file on a disk. I didn't hesitate to put copies of the Turtle JPEGs into this folder and give them to you. I copied those files from the hard drive without opening them, so the file did not go through the compression process when the copy was made.

### **GIF and JPEG: A Final Word About File Size**

These two formats are what you **MUST** use for web images, and they are also good choices for activities made in most applications. Both are file size efficient, JPEG by using a compression routine and GIF by using a limited color palette. JPEG will give you a lower file size for a slightly better looking image, but I've noticed that some applications decompress the JPEG file when it's loaded, thus losing the file size savings. If this happens, GIF may be the answer, particularly if there are not too many color shades in the image. Let's explore this trade off by inspecting two sets of photo images.

### **Images With Limited Palette and Complexity**

Open the two nightcrawlers images from the GIF and JPEG folder. I can't really explain the pricing in this one; it was on a gas station in my town. I don't know if those are gourmet nightcrawlers, or if the corn dogs and egg rolls are just not top quality. Anyway, if I was making an activity about funny signs, this would be included. I've saved both a GIF and a JPEG version of these, and even when you zoom in, the images are very comparable in visual quality. The JPEG is half as big, but if I was using one of those applications where the JPEGs tend to balloon in the activity, I wouldn't hesitate to use the GIF version here.

### **Images With Many Subtle Color Gradations**

Now open the other three images in the folder. The original, **IMG\_0035.JPG**, is a 10 megapixel photo of Irvine, California that I shot from a helium balloon. When I open it in PhotoShop®, by default it's reduced to 25% of its size on my monitor because all its pixels won't fit on there at once. Zoom in and you still see good detail. I could print this out at 300 dots per inch and it would be 12 by 9 inches on paper. But I definitely do not need that many pixels for an activity, and the file size of this image is 3.2 MB. I'd like to reduce that if possible, because 10 pages with images that huge would be well over 32 MB!



The remaining two with smaller file sizes, **city.jpg** and **city.gif**, were made by resizing IMG\_0035.JPG to 800 X 600 pixels, and saving as JPEG and as GIF respectively. Either one would solve the file size issue, though the JPEG is way ahead there. They both look okay, but there is some dotty-ness about that GIF!

Try zooming in once on both those images. The JPEG version still looks nice and smooth, but look closely at the sky and clouds in the zoomed GIF version. Notice those dots? They appear in a GIF image in areas where there is a continuous gradient of color because GIF with its mere 256 shades does not do gradients very well. GIF has a smaller set of shades to choose from, so you tend to get bands or dots instead of smooth gradation. This effect might be accentuated once the image is loaded into the activity. I'd try the GIF image if I was having the JPEG balloon effect, but if those dots showed, then I'd use a JPEG or even a 24 bit BMP version instead and accept the larger file size.

### When To Use Which

Why did the GIF image of the sign look better than the one of the city? Probably there are no more than 256 colors and shades in the sign picture, so the limited GIF palette was fully adequate. It's a very good format for clip art, for that reason. But with the many subtle shadings in the city panorama, GIF just doesn't have enough colors to avoid graininess. So with photos, plan to use GIF only where the color palette is limited, perhaps on photos of indoor scenes or close ups where one subject with fewer colors dominates.

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## Megapixals Do Count: Using Part of a Photo

After realizing that I only needed 800 X 600 pixel images at most for a full page graphic in most activities, I concluded that a 3 to 5 megapixel camera is about all you really need, and even a 2 megapixel camera works for most purposes. It would be different if we were professional photographers rather than educators, and if we were photographing to make fine art enlargements. We need images that teach kids about the world. But now and then there is a subject that requires more megapixels to photograph. Here is an example.

I have a 10 megapixel camera that I got mainly to photograph birds. Most birds are small, they tend to fly off if I get very close, and they are often in concealing foliage or other natural cover. My previous 5 megapixel camera tended to produce pictures of leaves or smudges rather than birds. But this camera lets me get just a little closer, close enough to get a good bird photo, once I crop out the bird part of it.

Open the four images in the folder MegapixelsDoCount.

### A 10 Megapixel Photo

**IMG\_0176.JPG** is my original 10 megapixel photo. I was able to use my zoom lens a little to get the bird visible, but I didn't do the full zoom. That tends to create a fuzzy image. It's a nice photo, but it's 2.9 MB and it would be compressed in visual size by a factor of 4 if I just loaded it directly into an activity. That might erode its appearance. Also, I think the bird might get lost against that busy background, especially for students with visual problems.

### A Resized Version

One option is to load the photo into an editing program and resize the entire image. The editing application resamples the entire photo, compromising between pixels before the save, so it yields a better result than making the multimedia application shrink it on the run. I

saved a resized version, **Resize.jpg**, and it's sharp and clear. When loaded into an application, it would retain this visual quality, because it would probably fit as is. The file size is down to 232KB, a real gain, but it still doesn't solve problem of the tiny bird lost in a big landscape.

### **Cropping Is The Answer**

The two images **Bird.bmp** and **bird.jpg** show where having 10 megapixels to work with can be a life saver. To create these, I opened my original image and used the crop tool to chop out a rectangle of 800 X 600 pixels including the bird. I edited the lighting a bit. Then I saved that as a BMP file. This will be my conservation edited copy. I also saved a JPEG version, quality level 8, to use in an activity.

Since I cropped rather than resized, there is no resampling involved. I'm just discarding the rest of the picture, and my final bird image has all the detail of the original, like a cookie cut out of a wide piece of cookie dough. Now I have a close up bird to fill my activity page. The file size is only 220 KB, perfect. No way could I sneak up close enough to get the bird to fill the lens like that!

And no way could I take that same picture at the distance I did, and get by with cropping out the middle, without all those megapixels in the total image. If I took the picture with a 3 megapixel camera from the same distance, the total pixels in the part around the bird would be only .15 megapixels instead of .5 megapixels. To fill a screen 800 X 600 pixels, that lower resolution image would have to be enlarged over 3X. By then, it would surely show some space between the pixels, and would look grainy.

In effect, I used only half a megapixel out of 10 megapixels in the photo, but the result is well worth it.

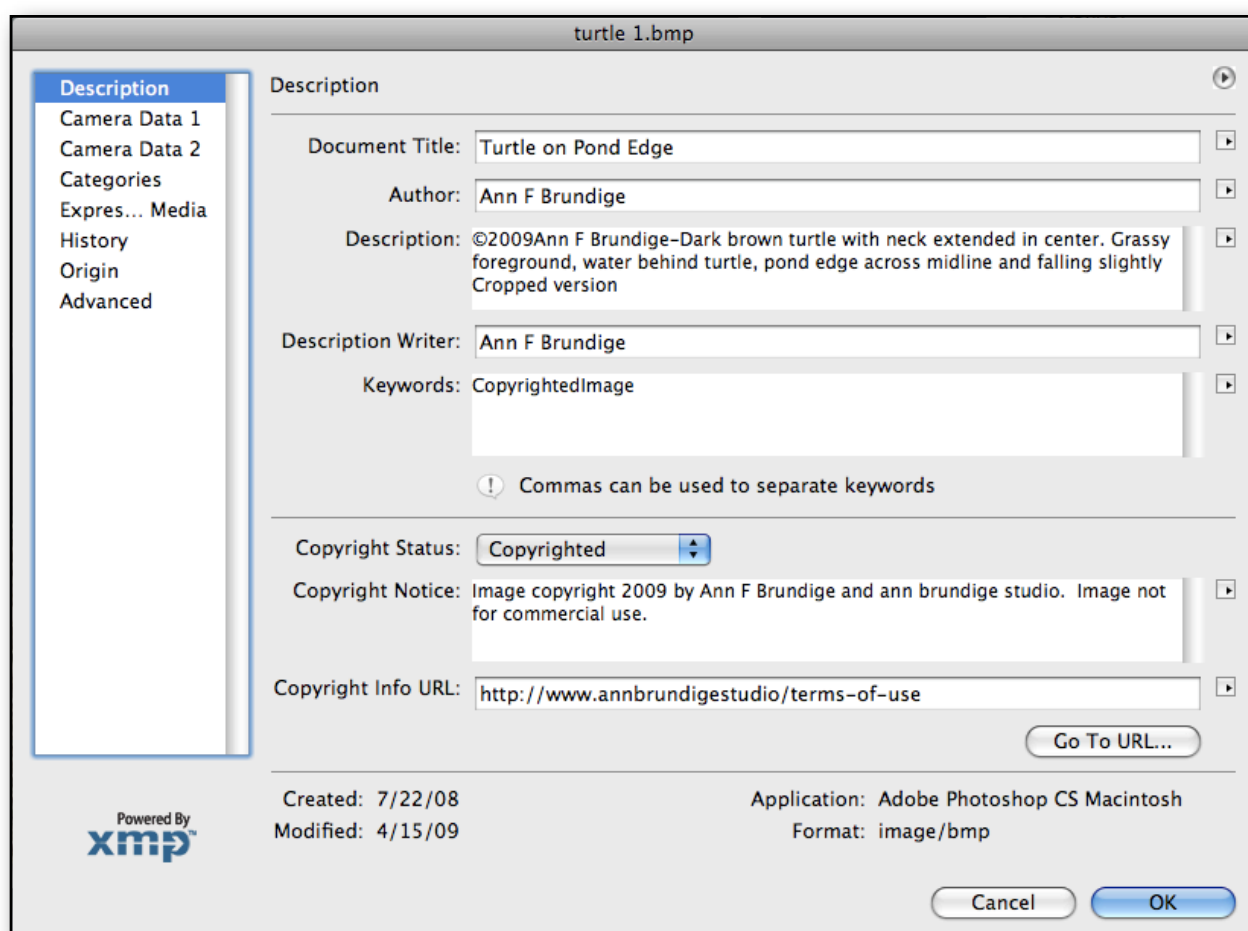


## Copyright Information In PhotoShop®

This part of the examples requires PhotoShop® or PhotoShop Elements®. Perhaps some other editing applications also have this information, but I haven't investigated any.

Open any of the example photos in PhotoShop® or PhotoShop Elements®. Notice that up in the title above the open image, it is marked as copyrighted. I was able to do that when I saved the image from PhotoShop®. Let's look at how that can be done.

Go to the **File** menu and choose **File Info**, about three-fourths of the way to the bottom. A dialog opens, giving a wealth of information about



the image. Let's take a closer look.

Notice that there is a special spot to mark if the image is copyrighted. That's what put the copyright mark into the title line. I was able to fill in a title for this image, my name as author, and a detailed description. If somebody stripped off this information, my copy with this description would help prove it's my photo. That's not of major importance to me personally, and most people are honest and would not remove the information. But if I was selling the photos, particularly online, this might be very important.

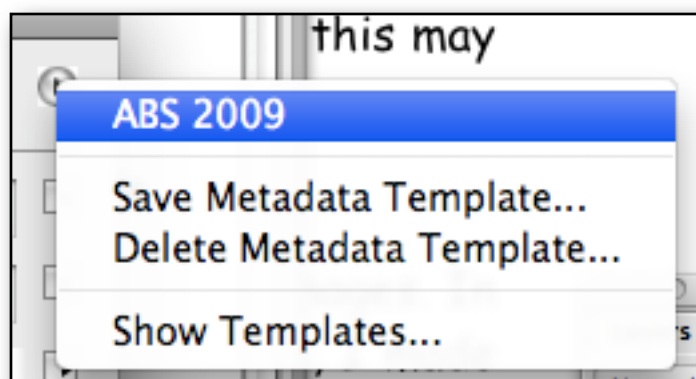
You have the option to write out some terms of use in the copyright statement window. You could add a contact address here, too. There is also a place to insert the URL of a webpage for more details of terms of use. If you have a contact option on your webpage, someone could use this link to get a permission from you.

On the sidebar there are many choices other than this description page. The **Camera Data** and **Origin** information comes right from my camera. Under **Advanced**, I can see what information will travel with the photo if I made it into a PDF or other format. It looks like you can also add some tags and category information to help find this photo in a collection.

### Creating And Using A Metadata Template

It's a good idea to add this information to images you distribute in handouts, activities, and on the web. But it's a lot to fill in.

Luckily, much of the information would be the same for all your images, except for the title and a specific description of the image. Even more fortunate, there is a way to create a metadata template containing



this information that you can load each time. Look for a tiny button with an arrow in the upper right. When you click and hold it, you get a drop-down menu with several choices. One choice is to save a metadata template.

To create your template, first fill in all the data that will be the same each time. For example, I put my name, copyright statement, the URL, the description writer (me), and the beginning of the description as "©2009 Ann F Brundige" into the template. I also set the copyright status to "copyrighted". That's about all the information for my images that would usually be the same. Once you fill in all this common data, go to the button on the upper right and save as a template. Give it a title you will easily recognize. Of course, you could save several templates for different situations.

To use the template, open an image, go to File Info, and click the upper right button. My template shows up as the first choice. Load in your template, then fill in any remaining information including the title and the rest of the description. Click okay, save, and you have a copyrighted image!



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