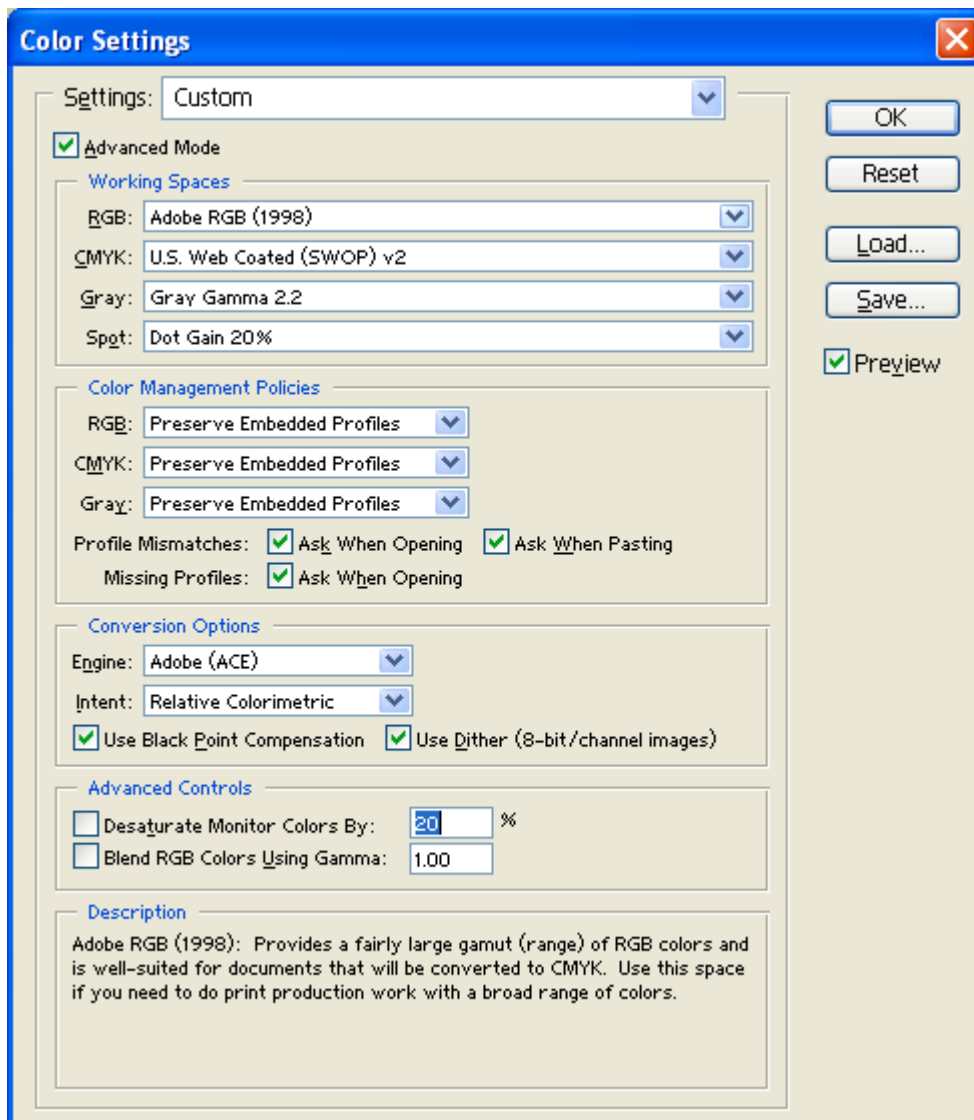


My Color Managed Workflow (as of December 3rd, 2004)

A workflow for creating great output requires a number of steps that need to be performed more or less in the same order. I've divided these steps somewhat arbitrarily into when you need to perform them.

Before acquiring

- A properly calibrated and profiled monitor is essential. I'm not obsessive about it, but I do use Monaco EZColor once a month. It also takes care of setting my Windows display profile.
- Set up Photoshop's color management policies from *Edit > Color Settings....* It sets working spaces, which tells how to interpret the color of pixel values, and profile policies. The right policies ensures that you have a consistently color managed workflow and will be more likely to get what you're expecting. Here's what I use:



If you want to know more about why to use these settings, I recommend reading Tim Grey's *Color Confidence* as a straightforward, high-level introduction.

- Set your scanner's output profile to match your Photoshop RGB working space if you can: probably *Adobe RGB (1998)*.

If, like me, you can't set the profile, determine your scanner's default output profile using Monaco EZColor and an IT-8 scanning target (about \$30).

Acquiring images

1. Dust off the image. First use a soft, anti-static dusting brush—I like the one by Kinetronics—and follow up with a photo-safe compressed air product, such as the Beseler Dust-Gun.
2. Import images into Photoshop. I find it easiest to use my scanner's interface within PS by selecting *File > Import > Scanner Name*. I don't have to save images to an intermediate file first. (But if my scanner had a RAW mode, I would probably save to RAW and then import into PS.)

I usually scan images in batches of 5 to 10. It seems easier to be doing the same kind of task for awhile without switching.

3. There are two schools of thought on when to make image adjustments when scanning.

One says to do all of the tone, contrast, and color adjustments in the scanner's software before importing. The benefit of this mode is that you will make the best use of the scanner's dynamic range, improving the image's gamut when you import it. If your scanner has good color fidelity and you can assign a particular colorspace from your scanner software, this is probably the right thing to do.

The other holds that you should make as few adjustments as possible in the scanner software. If you're scanning in 16-bit mode (sometimes called 36-bit or 48-bit mode), you can usually make all of the same adjustments in PS with the benefit of being able to undo and combine changes. More importantly, if the scanner is not color managed, this is the only way to ensure that the pixel values can be matched to a known colorspace—though you could scan an IT-8 target with each scan that involves levels, curves, etc....yuck. I don't do any curves or adjust the levels or gamma in my scanning software

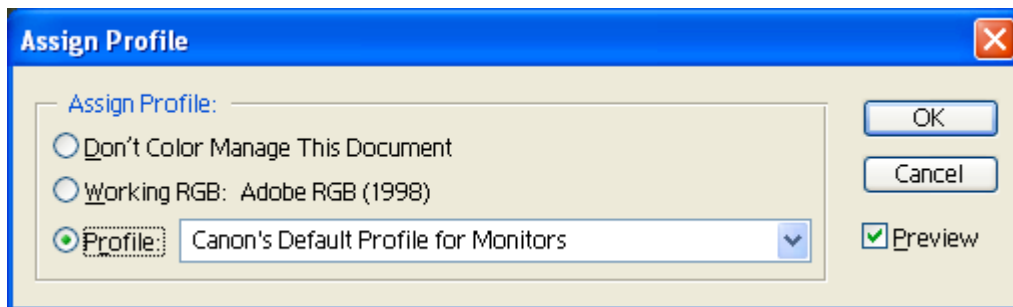
4. There are also different thoughts about what resolution to use when scanning. I say that it's too hard to know all of the ways that an image will be used, so I scan at the maximum resolution my scanner supports. Photoshop is very good at resizing images downward without losing quality, so I can easily make an excellent 8x12 or 6x9 print or save a 400x600 pixel image for the web from the same 2700 dpi scan.

The downside to scanning at maximum resolution is that it takes a lot of storage space. Storage options are cheap, though. Today you can buy 200GB of external storage for about \$250 and a full terabyte (1000 GB) for only \$1,000. Cheap!

Processing to Make a Pleasing Image

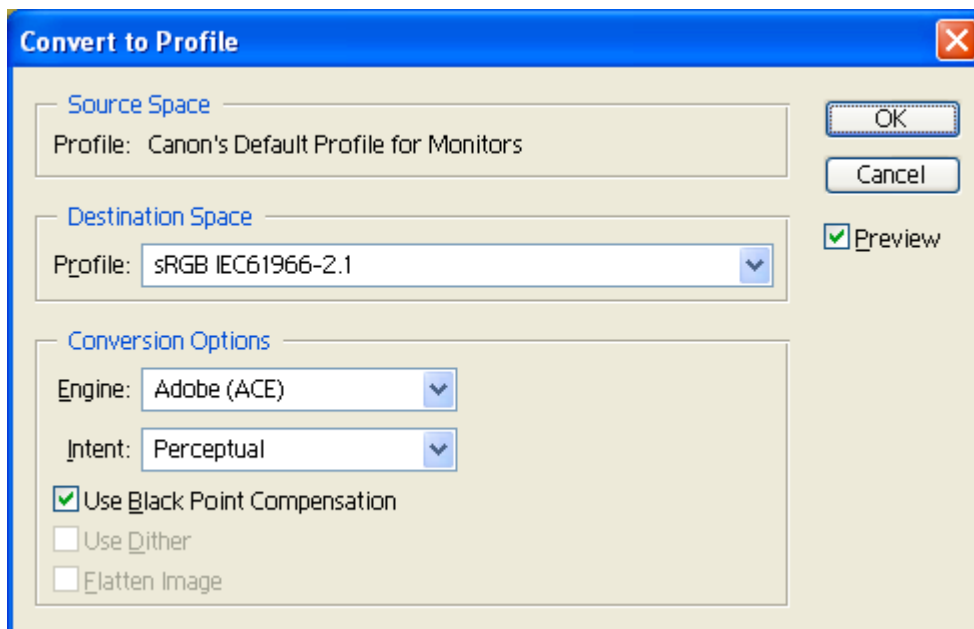
1. If you've decided to wait until after acquiring the images to make any adjustments, the first thing to do is to put the images into Photoshop's default color working space. It's critical for you and PS to have the same notion of the colors in a file when you're working on it.

First, assign the profile for the colorspace the image was scanned in. For me this is "Canon's Default Profile for Monitors." If you've profiled with an IT-8 target, use that profile. Assign the profile by selecting *Image > Mode > Assign Profile...*



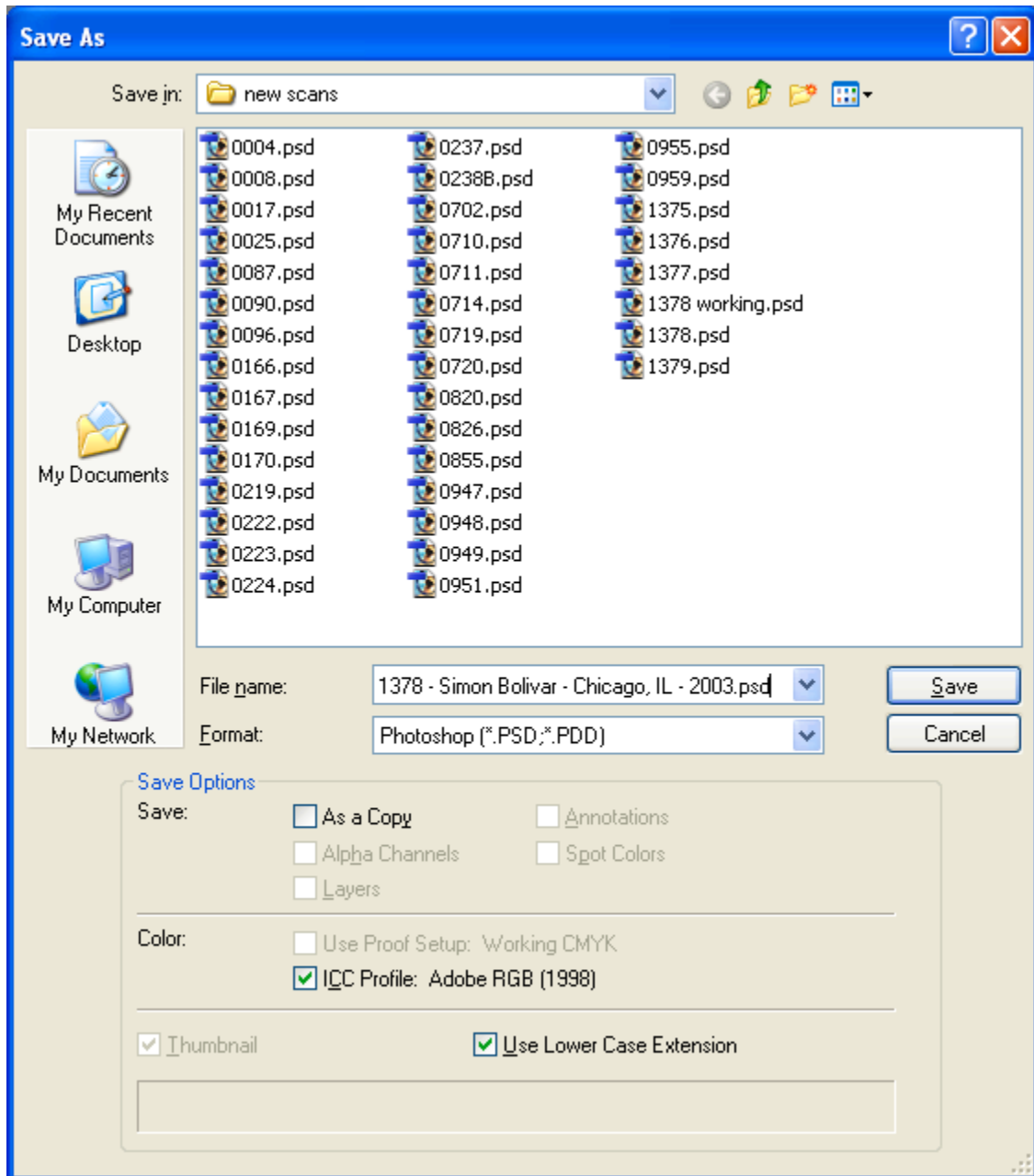
The image may appear to change colors or become washed out. That's a result of Photoshop reinterpreting the color values of the pixels. Rest assured this is important for getting the right colors at output. We'll improve the appearance of the image later.

These import colorspace usually aren't good for editing images, though. Convert the image to your default Photoshop working space using the *Image > Mode > Convert to Profile...* menu option.



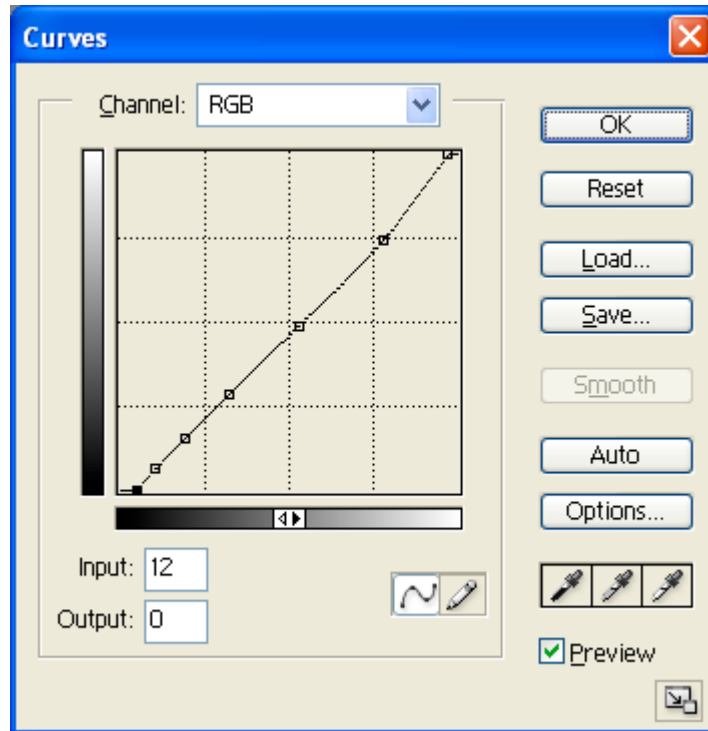
2. Save the image. What to name and where to put files is a matter of personal preference. I tend to keep all of my unprocessed scans together in a folder called “New Scans” with filenames like “1378 – Simon Bolivar – Chicago, IL – 2003.psd”. The first number is a unique ID that I increment for each scan; I write this number on the back of the slide mount so that I can easily find a digital version of a slide.

I save images in Photoshop .PSD format. It uses lossless compression, stores all image and adjustment layers, and is color managed. Be sure to check the box for the color profile. TIFF is also a good format. Don't use JPEG for saving your working images; it introduces image artifacts and degrades each time you open and then save the image.



I keep track of these images and their details in an Excel spreadsheet. Use whatever naming convention is most natural to you, but consistency will help.

3. Adjust the overall image brightness, contrast, and color balance. For very simple adjustments of the overall brightness, levels are okay. Curves give much more control over both the brightness and contrast in various parts of the image, but adjusting curves is an art that requires a lot of practice.



When working with curves, moving the left- and right-most points is akin to adjusting the black and white points of the image, respectively. Pixels whose values or intensities are in the steeper portions of your curve will have more contrast since the change between lighter and darker values becomes greater. Flatter areas of the curve will be flatter, or have less contrast. Curves are a great way to adjust black and white points (by moving the end-points), add shadow detail (by having a steeper curve in the shadows), prevent highlights from blowing out (by controlling the steepness of the curve in the highlights), and adjust tonality (by raising the quarter- and midtones together).

Curves are also the best way to adjust color balance, since they offer a great deal of control over all of the parts of an image. Color correction involves creating curves that push an image's truly neutral parts (blacks, grays, and whites) to have RGB values that all match (to within 1-3 RGB values). Dan Margulis literally wrote the book on this type of color correction. You can get a [brief synopsis](#) online.


4. It's best to make most of the image look as good as possible before working on any particular tricky part. To make local brightness/contrast or color adjustments, create a selection then create a new adjustment layer. Make the adjustments and then use the paintbrush tool to paint the effect on or off.

White parts of the "layer mask" will show the effect at 100% opacity. Black parts won't show the effect at all. Gray parts of the image have opacity somewhere in between, de-

pending on how dark the gray is. This is definitely an advanced maneuver but a very valuable one to know. A Wacom tablet will help you make these adjustment layer masks, since you will be able to vary the size of the brush or the amount of the effect based on how hard you push on the stylus.

I recommend using separate adjustment layers for color, global brightness/contrast, and local brightness/contrast adjustments. It's easier to undo mistakes this way.

You can also use layer masks with other things in Photoshop, including some sharpening filters.

5. Clean up dust marks and scratches on the image. I like to use the healing brush. 
6. Make any other basic, “nondestructive” image adjustments as adjustment layers on the same master image as you saved above. When you come to a fork in the road where you could start making different kinds of more artistic changes, it's time to duplicate the master image and save to a new file. Use *Image > Duplicate* followed by *File > Save As...* to create a new working copy.

Advanced, “destructive” changes include cropping, converting to black-and-white, replacing colors, toning an image, selective sharpening, using artistic filters, and so on. The point of saving a new file is always being able to go back to a “good state,” the master file.

Save these new files with whatever name you want. I keep mine in the same folder as my master images, adding a small description to the end of the filename that describes the change. For example, “1378 – Simon Bolivar – Chicago, IL – bw, cropped, toned.psd”. Keeping them in the same directory lets me see the original and all of the different work products together in my image management program.

Preparing to print

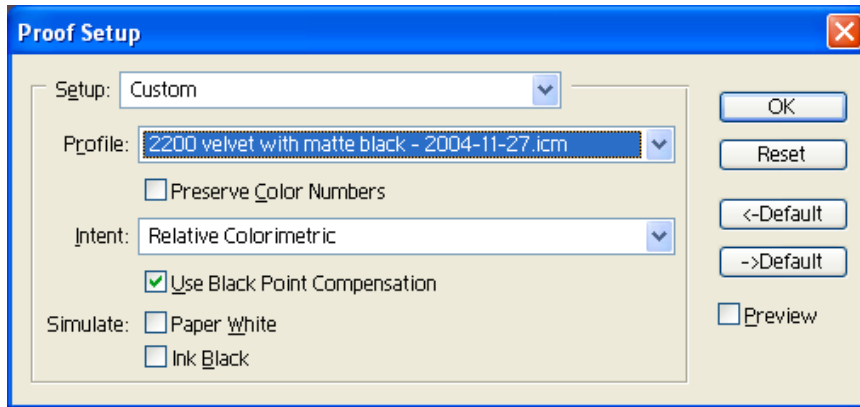
Even with the best color managed workflow, what you see on the screen won't exactly what you'll see on the printed sheet. Different printers use different inks, plus each ink and paper combination has its own color gamut and appearance. Furthermore, images are viewed under different lighting conditions than a monitor, which prohibits “what you see is what you get.”

But we can “proof” to approximate what it will look like when printed and viewed under ideal conditions. The purpose of proofing is to get a feel of what will be unacceptably different in the final print.

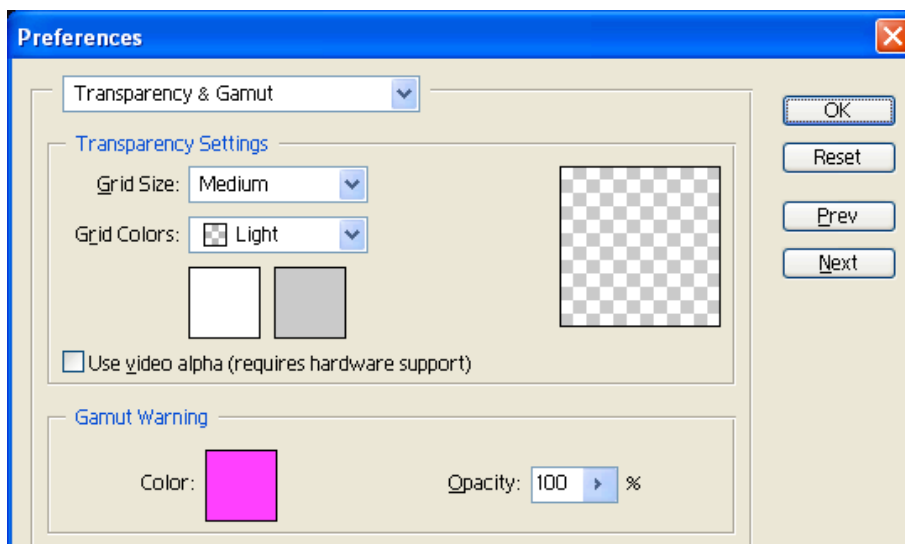
If you've followed the color management steps above, proofing is a snap.

1. Save a new version of the file. I believe that having a separate copy of each final work product is essential for working with different papers and inks. Saving an image that encapsulates all of the steps needed to get a final print makes it very, very easy to get the same output for the next show or sale. I save my files in a folder that contains other prints and I append the output size and paper type to the filename.

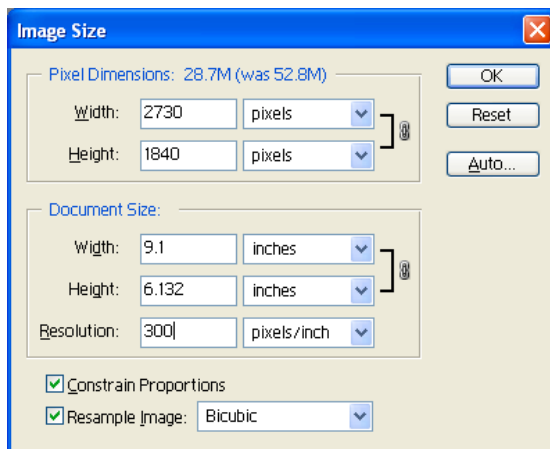
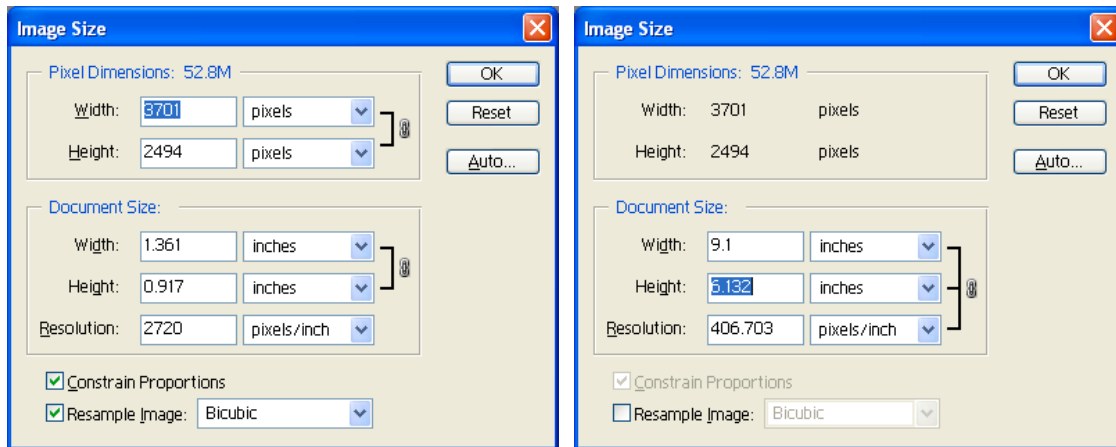
2. Flatten the image: *Layers > Flatten Visible*. This will merge all visible layers.
3. Select the paper and ink combination you're going to target: *View > Proof Setup > Custom...*. I recommend leaving the "preview" box unchecked. The "Relative Colorimetric" intent preserves neutrals (black, white, and gray) and other colors accordingly. For very saturated images where many colors are out-of-gamut, using "Perceptual" preserves color relationships and maintains the appearance of saturated colors. When printing to inkjets, "Perceptual" is a good bet. When preparing images for the web, use "Relative Colorimetric." Avoid choosing "Absolute Colorimetric" and "Saturation."



4. Turn on print proofing: *View > Proof Colors*. Some people find it too depressing to see their beautiful images lose color saturation, so they close their eyes and press CTRL+Y to turn on proofing. Look for places where the color balance is now off or the image is unpleasant. Create new adjustment layers and apply curves as needed.
5. Show out-of-gamut colors by selecting *View > Gamut Warning*. This mode displays one particular color for all of the colors that can't be faithfully reproduced by the ink/paper combination. I recommend using a very saturated magenta color, which probably doesn't appear in most images: *Edit > Preferences > Transparency & Gamut...*. Make additional adjustments (as layers, of course) to bring most of the out-of-gamut colors into the gamut.



6. Save the image. Save early, save often.
7. If you haven't already cropped the image for artistic purposes, now is the time to trim anything you don't want in your final print.
8. Resize the image: *Image > Image Size....* The exact settings you use here will depend on the size of print you are making and the resolution (DPI) that your printer requires. For the Epson 2200, both the manufacturer and printmakers recommend a setting of 300 DPI.



First, uncheck “Resample Image” and then set the Document size to match the output size. When I’m going to mat something, I usually make the image slightly larger than the mat opening to ensure that the border doesn’t show through.

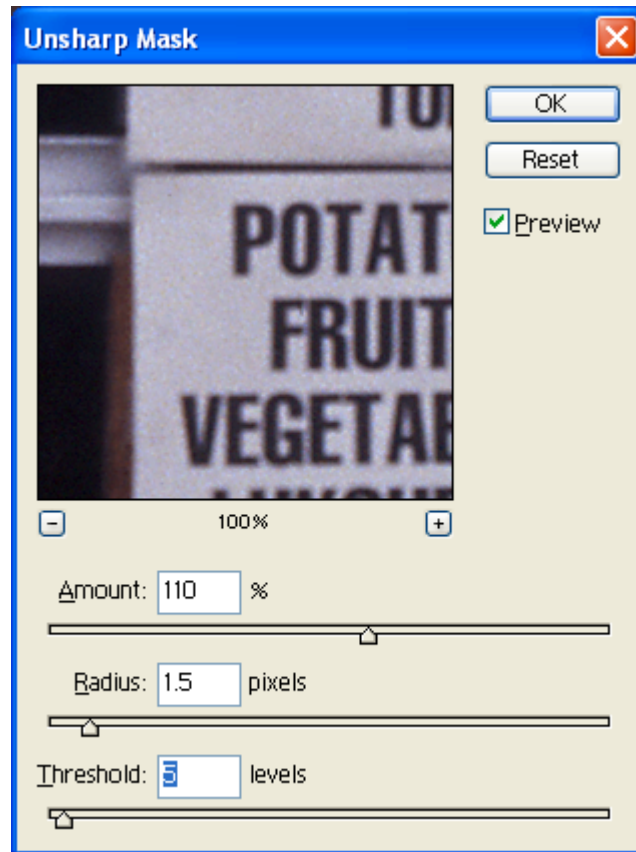
Next, recheck “Resample Image” with “Bicubic” selected. Change the resolution to match the requirements, 300 pixels/inch.

Press “OK” to resize the image.

9. Apply an “Unsharp Mask” by choosing *Filter > Sharpen > Unsharp Mask....* The unsharp mask produces the appearance of sharpness by finding edges and exaggerating them by adding tiny halos.

This is the first time when you should actually need to sharpen the image. Sharpening earlier can introduce noise (at worst) or will be undone when you resize.

The actual values to use depend on the content of the image. Since we’re adding a halo around edges, we want to pick settings which create a halo that (a) is visible without being obvious, (b) won’t overwhelm fine details, and (c) only sharpens real edges (not noise).



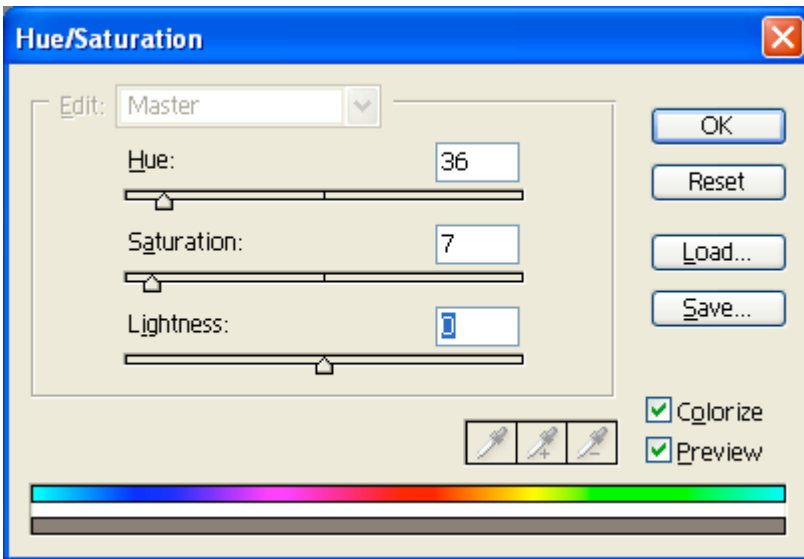
- First, start with “amount” and “radius” at the maximum values and threshold at 0.
- Adjust the radius until the halo size doesn’t overwhelm details.
- Reduce the amount until it looks good.
- Increase the threshold to prevent sharpening smooth areas.

I have found that these recommendations from Tim Grey’s *Color Confidence* work well for 6x9 to 8x11 inch images. Smaller images saved for the web need both smaller radius and amount values.

	Fine Detail	Average	Low Detail
Amount	200 – 300%	100 – 150%	75 – 125%
Radius	0.5 – 0.8	1.0 – 1.5	2.0 – 3.0
Threshold	0 – 4	4 – 8	8 – 12

10. If you have a persistent color cast that appears when printing a black and white image with a particular ink/paper combination, consider toning the image. You’ll be introducing a color cost, but it hopefully will be a more pleasing one.

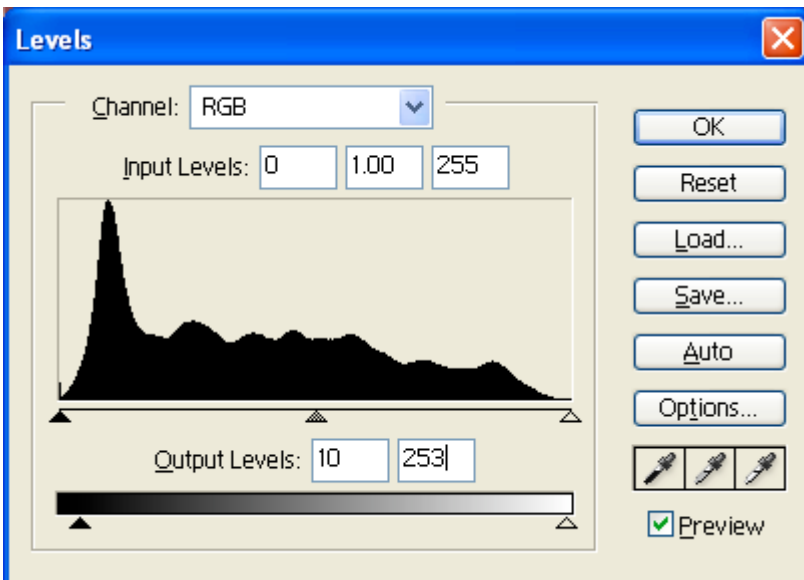
First convert the image to an RGB color image if necessary. Then create a new Hue/Saturation adjustment layer. Hue, Saturation, and Lightness values of 36, 7, and 0 usually produce pleasing, subtle, sepia-tone results. Be sure to check “Colorize.”



11. Because inkjet printers don't do a great job producing fine detail in the deepest shadows or the brightest highlights, Tim Grey recommends remapping the output range to match the values the printer actually can produce. It's necessary to print a test pattern that contains a step pattern from the absolute black (0) to a slightly "lighter" black (about 30). The output range starts where it's possible to pick one black patch from the neighboring patch. A similar test pattern is used for the highlights.

You must produce a test pattern only once for each paper and ink combination.

To use the black and white values from the test pattern, create a new levels adjustment layer (*Layer > New Adjustment Layer > Levels...*) and enter the values into the output levels boxes:

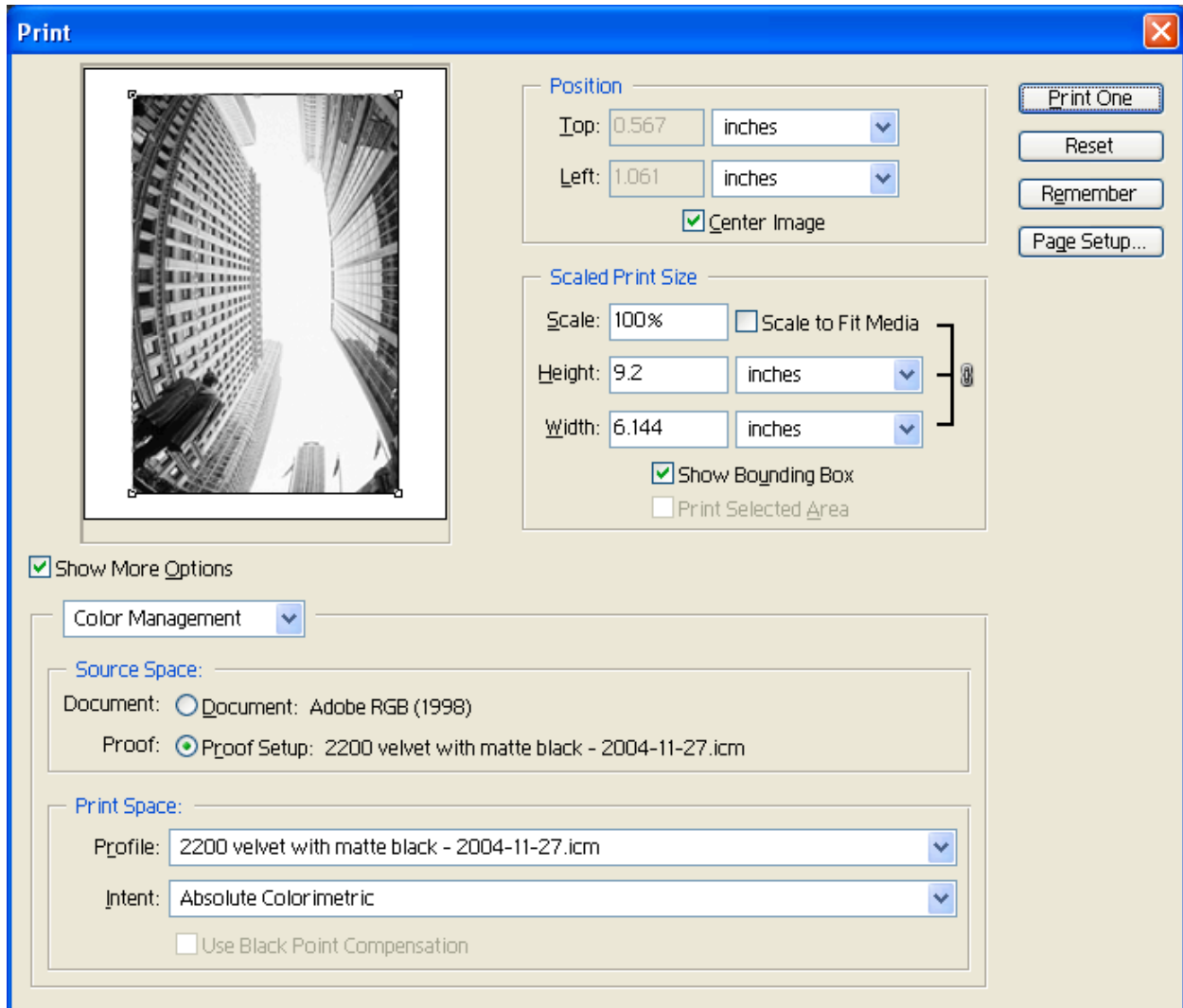


12. Save the image for the final time; for example, "1378 – Simon Bolivar – Chicago, IL – bw, cropped, toned – print 6x9.psd".

Printing

Finally, we're ready to print. If proper color management procedures have been followed, it should be easy to produce an image that closely approximates what you see on the screen. In fact, in a good workflow the majority of the time is spent in the middle, artistic steps and very little time needs to be spent preparing the color management settings or printing the image.

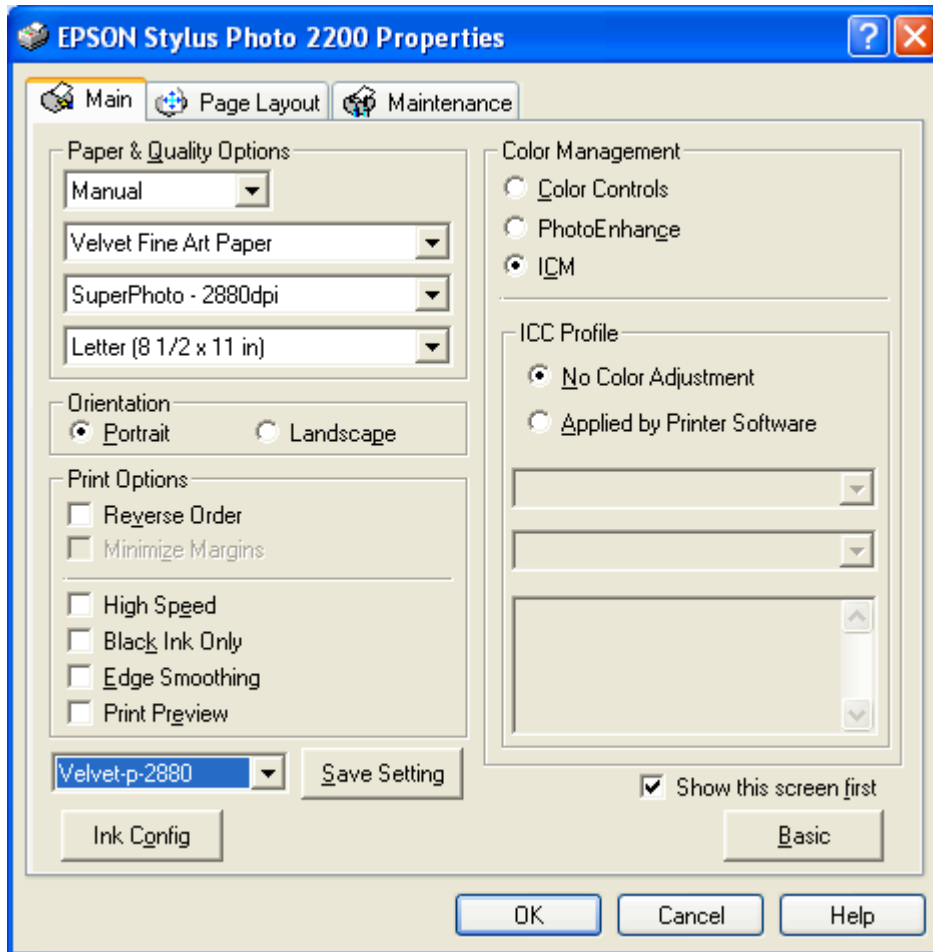
1. Select *File > Print with Preview....*



Select “Show More Options” to display the “Color Management” options. Since we proofed colors earlier, select the proofing colorspace as the source space. Because we proofed for the medium that matches our printer/ink/paper combination, the source space and print space are the same. This is one of the times when “Absolute Colorimetric” makes sense for the rendering intent.

Choose “Page Setup...” if you need to switch from landscape to portrait or vice versa.

2. Press “Print...” and select the printer from the list. Press “Properties...” to display a dialog box containing the printer’s settings. Here’s what the dialog should look like when printing to Epson Velvet Fine Art paper on an Epson 2200 printer:



For best results when printing from Photoshop, use these color management options in the Epson printer driver. Selecting “No Color Adjustment” ensures that the profile conversion only happens once when the data is sent from Photoshop to the printer.

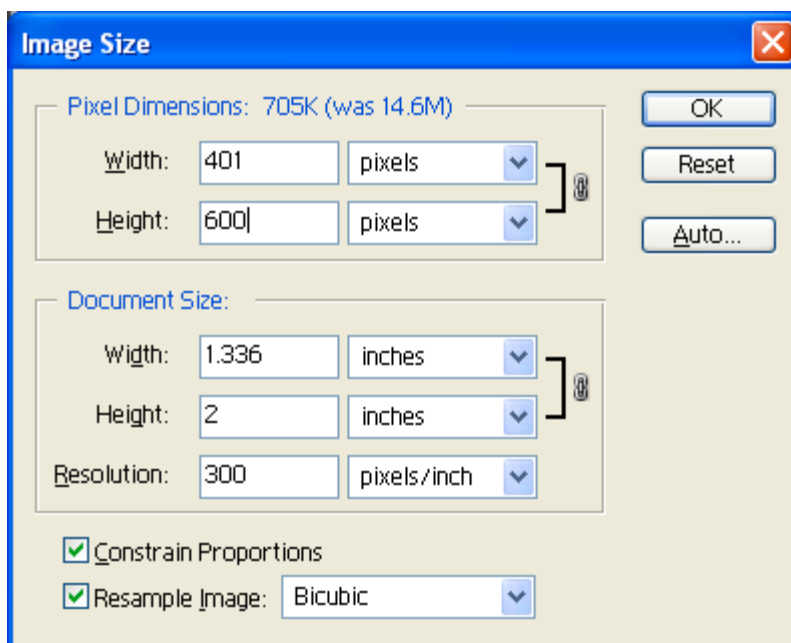
Also notice that I’ve saved the settings with the name “Velvet-p-2880.” In the future, I will be able to quickly select these options from the dropdown list.

3. Select “OK” to return to the Print dialog.
4. Load paper into the printer. Press “OK” to send the image.
5. Take the results from this first print and make fine adjustments to produce another, higher quality print, making changes to the various adjustment layers of your output specific version. Save the image.
6. Print again. Repeat steps 5 and 6 again as necessary.

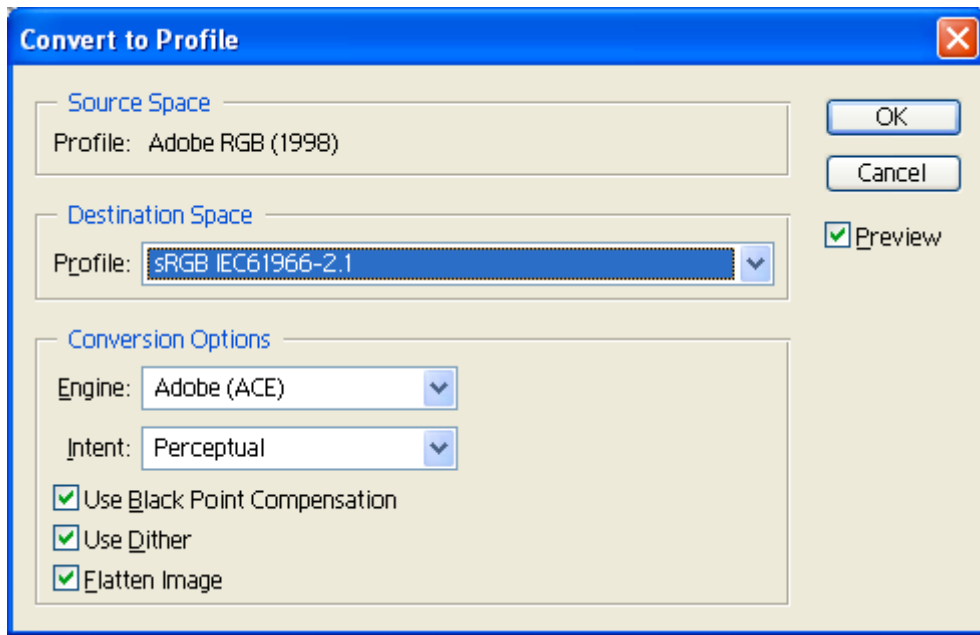
7. By now you should have a very good print. Plus you have a perfect file for making many prints with the same paper/ink combination at a given size.

Preparing Images for the Web

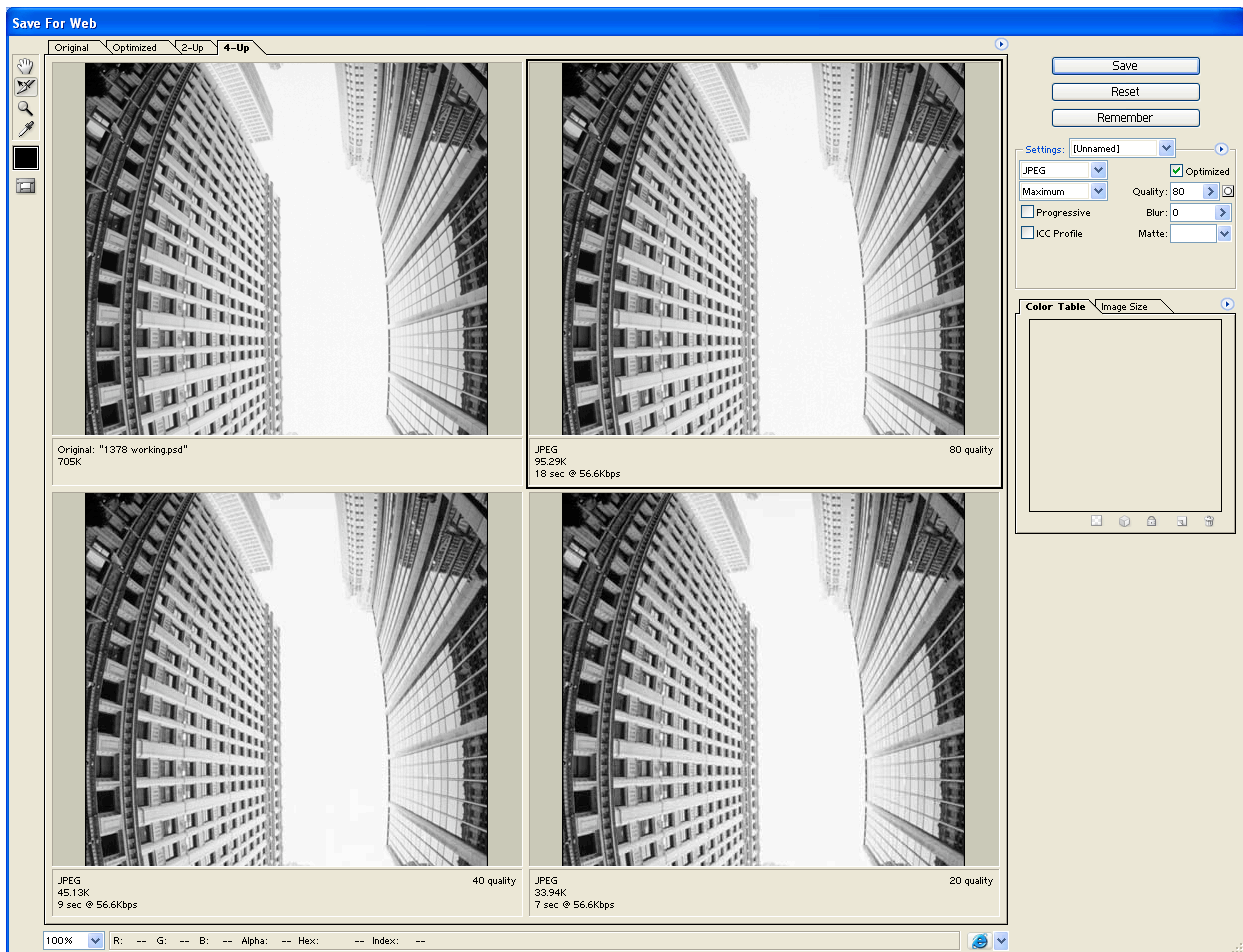
1. Start with the master file from step 6 of “Processing to Make a Pleasing Image.”
2. Duplicate the image: *Image > Duplicate....*
3. Resize the image: *Image > Image Size....* Unlike when printing, the resolution value doesn’t make any difference on the web. Change the height and width pixel dimensions values to be the desired output size. Check “Resample Image” and select the “Bicubic” resampler.



4. Sharpen the image using the Unsharp Mask filter: *Filter > Sharpen > Unsharp Mask....*
5. Convert the image to the sRGB colorspace, which attempts to approximate the “average monitor” that might display the image. It’s not perfect, but it’s as good as you can get now. Select *Image > Mode > Convert to Profile....*



6. Save the image for the web: *File > Save For Web....*



Most photographs look best on the web in JPEG files, which is a mixed blessing. The files tend to be quite small, but that's because image quality is degraded to a certain de-

gree. Use the Save for Web dialog to compare various JPEG compression settings to find an agreeable trade-off between file size and image quality. The tool allows you to simultaneously compare three different compression ratios with the uncompressed image.

I find that for a 600x400 image with average detail, an image size around 100-150K looks good and loads in an acceptable amount of time. Be sure to experiment.