



Focus on Imaging June, 2002

Tools for NOISE Reduction by Jack and Sue Drafahl

When our primary recording media was film, we had only a few options for reducing grain. You could use fine grain films or higher speed films and special developers designed to minimize the grain. Today, with the advent of digital, it's a much more complex challenge. We now have digital camera noise and file compression artifacts in addition to the usual grain issues. Since all three have similar solutions, we have grouped them into a new image problem group called "Noise Reduction."

BEFORE WE SHOW YOU some solutions for noise reduction, we need to step back and look at the problem. Film grain is caused by the use of higher sensitive silver halide crystals to achieve increased film speed.

Over the years film manufacturers have used elaborate film technology to flatten the crystals in order to maintain the film speed yet reduce the final grain size. Even so, the grain is still apparent when image enlargements are made. The second type of image noise came with the introduction of scanners and their resulting digital image files. To save data space, these files are compressed to smaller files which results in compression noise. This noise appears as jaggies and clusters of rectangular data when the image is enlarged.

The third type of image noise is associated with digital camera images. When digital image files are underexposed or set to high digital ISO speed, you will start to see color artifacts in the deep shadow areas. In most cases the highlights are unaffected, so this problem is usually the easiest to solve.

In researching potential solutions for noise reduction, we found many experts, each with a different solution to the problem. Some of their ideas did a good job reducing noise, and a few provided excellent results. Here's a list of possible solutions we tried and found effective. Some solutions target one type of noise, while others address more than one.



Notice the reduction in grain structure and the removal of scratches on the right. ICE technology does this during the scanning process.

GEM Technology in Film Scanners (for film grain)

The best solution we found for reducing film grain comes with film scanners that incorporate Applied Science Fiction's Grain Enhancement Management (GEM) technology. This grain reduction technology analyzes the image during the scanning process, and using special algorithms, it dramatically reduces the grain.

We tested the Nikon 4000ED film scanner that uses this technology, and found its slider setting can be varied to match the grain level in the image you are scanning. The final image is a little softer than images scanned without this technology, but not to worry.

We found that the unsharp mask in Adobe Photoshop reversed this problem without reintroducing the grain. Scanning with the GEM process does increase the scan time, but the results are well worth it. (www.asf.com)

SilverFast Ai Software (for film grain, digital camera files)

The SilverFast offers a software solution for both film scanners (SilverFast Ai) and digital files (SilverFast HDR) up to 48bit color. Both programs use a descreening feature that allows you to set the filter to dpi setting that best matches the noise in your image. A 50dpi setting would be for images with a lot of noise or grain, and 133dpi would be less. A

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small preview screen allows you to see the before and after results from your prescan or digital file. They can be setup as Photoshop import filters, or as Twain input devices for other editing programs. (www.silverfast.com)



The left panel is a standard color negative film scan with no ICE technology applied. The right panel uses Adobe Photoshop Smart Blur filter to reduce the overall grain.

Smart Blur (film grain, digital camera files)

If you want a quick fix for your digital images, you might consider using the Smart Blur filter found in Adobe Photoshop and Corel Painter 10. When using this filter in Photoshop, you will be presented with a small preview menu and two sliders.

Set the radius slider to 1 and the threshold to 10 when you start out. Increase the threshold until you see the desired result in the preview window. Once the filter is applied, you can use the unsharp mask to recover some of the sharpness you lost without increasing the grain. (www.adobe.com)

In Corel 10, there is a slider that can be adjusted from 1-10 to provide varying degrees of blurred effects. Corel Painter also has a similar filter, appropriately called Remove Noise, that works much like the Smart Blur filter. (www.corel.com)

Channels Menu (film grain)

Another method used by many photo editors to reduce film grain is the channels menu. When you load this pulldown menu, you are presented with RGB, Red, Green, and Blue channels. If you scroll down through each channel, you will find that one (usually blue) has considerably more grain than the others.

If you select that channel, you can then use the Smart Blur or Scratch & Dust filters to reduce the overall grain in that channel. When you reselect the RGB channel, you should see an overall reduction of grain.

You can then go to other channels that have grain and reduce them proportionally. To achieve maximum control we recommend that you make these adjustments to a duplicate layer and then blend it with the background layer to fit your specific requirements.



The image above uses the Photoshop Color Picker filter to select grainy areas in the out-of-focus background. The dust and scratch filter was then applied to the background selection leaving the detail in the bird intact.



On the left is an extreme enlargement of a S1Pro digital camera file. The right panel shows the result after using the Color Picker in Photoshop to select the shadow areas and apply the smart blur filter.

Color Picker (film grain, digital camera files)

If you want to spend a little more time reducing the noise and achieve a higher quality image, you can use the color picker to select the color areas with the most image noise. Use the zoom tool to magnify the image and scan across it to see where the problem areas are located.

Also check to see which areas you want to protect from the process. Then using the color picker, select those areas that have the greatest amount of noise. Feather the selection slightly so it blends smoothly into unaffected areas, and then apply either the Smart Blur or Scratch & Dust filters until you achieve the desired results.

In some cases you will have different levels of noise to reduce, which will require the color picker being used several times. In those areas less affected by image noise, you should use smaller filter settings when applied to those areas. We highly recommend the use of a duplicate image layer for these corrections and then combine it with the unaffected background layer.

Magic Wand (all digital files)

If the image noise has nothing to do with a specific color, such as a multicolored background, you can use the Magic Wand to select the affected areas.

Using the add select function, add any additional areas with noise until all areas are selected. If the Magic Wand has selected areas you didn't want selected, you can use the Polygonal Lasso in the subtract mode to remove them. Feather the final selection slightly and then use the Smart Blur or Scratch & Dust filters to reduce the noise in those areas. If the noise is at different levels, you may have to repeat the process for each affected area.

Fractal Compression Programs (all digital files)

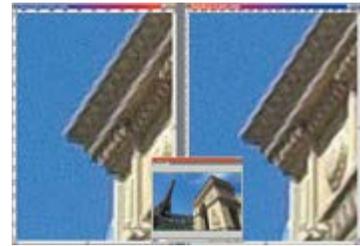
Low resolution digital files from scanners and digital cameras will have jaggies when enlarged to extreme print sizes. The resulting jaggies are what we call compression noise. The solution is a very sophisticated fractal compression program called

Genuine Fractal Print Pro. With this program, you load in the affected file and save it as a fractal file. Then load the new file and increase the image size to the required output size. The program will analyze the data between the jaggies and provide a smooth blend that dramatically reduces the compression noise. You can even use the Unsharp Mask to sharpen the image further. (www.lizardtech.com)

Mix and Match

During our research we found there is no perfect solution to noise reduction. Until a better mouse trap comes along, we need to continue to use what is available. Since everyone's perception of quality is different, you will have to experiment with the various solutions presented to see which one, or which combinations, work best for you.

Jack and Sue Drafahl are freelance writers and professional photographers living on the Oregon Coast.



On the left is an extreme enlargement of a Nikon D1 compressed digital file. The result on the right is after saving the file as a Genuine Fractal file and reloading at a 300% increase in image size, which reduces the jaggies in the image.

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