

All traditional photographs have some grain. All digital images contain some noise. In both cases, you can reduce but cannot remove all the grain/noise. With experience, a photographer learns how to control the amount of grain or noise as they capture the image. Post capture, **noise filters** allow some control of the amount of noise in your digital image; you can make the noise less obvious. There are two types of noise: **color noise** shows up as red/green/blue pixels or clusters; **luminosity noise** forms in the gray scale and contrast. Long time exposures may also create noise; as the imager becomes warm the heat can be mistake for the photons that record your image. **Sharpening** in any image editor without dealing with noise first will increase noise. The visual impact of noise increases as you enlarge an image.

“...think of digital noise as non-image-forming picture elements (pixels) that detract from a digital image.”¹

The **noise filters that come with image editors** (iPhoto, Elements, Photoshop) do not offer as much control over results as **noise reduction programs** do (Noiseware Community Edition, NoiseNinja, Halicon Filter, Neat Image).

Using a noise reduction program as a plug-in creates a better **workflow** than a stand-alone program does. However, not all **plug-ins** work to full capacity in other programs, so check for support information for your program before making a purchase.

Profiling analyzes the type, density, intensity and distribution of any noise as separate from details that you would not want to change. You can let the program set the corrections, follow the program recommendations or in the more sophisticated programs, use sliders to have more control over the changes. **Filtering** changes the selected pixels to remove the noise.

Color Noise is the most obtrusive so work on it first. It is most apparent in the even tones of images taken with higher ISOs. Color noise is most apparent in the shadows so it is easier to create color noise when correcting underexposed photographs. Correcting for color noise may cause a slight shift in hue.

Luminosity reduces monochromatic noise (200+ ISO) so watch carefully that you do not remove too much detail, that you do not make you image appear flat.

The direct recording of what the camera sees is done in a machine language called **RAW**. All digital cameras create the photograph in machine language. Some cameras are hard-wired to compress that data into **jpeg** automatically. Some cameras allow you to choose whether your image is recorded onto your card in raw or converted to jpeg.

RAW files are the equivalent of a digital negative. (*Newbie yak,yak: The difference in the results of working with a jpeg image and a raw image on the screen of your computer seems to be like the difference between printing a film image on ordinary paper and really good photographic paper. If you are printing the image, your will take that really fine record of everything the camera captured and a really good photographic paper to create the best of all images.*)

RAW processing with the Adobe RAW Converter (**ARC**) does not degrade the image. So, do your detailing (sharpen, noise reduction) in RAW first to keep all of the information your camera has captured. **Sharpening** in RAW or any other image editor without dealing with noise first will increase noise. (*Newbie note: Even after you process your image and prepare it for printing or*

¹ *Shutterbug* July 2008 Vol 37: #9: Issue 454: pp 76-84.

“Tools:Software by Jack Neubart: Quieting Noise: Digital Noise Is Easily Controlled With These Plug-in Filters”

competition, you should save at least your best images in RAW (as well as jpg, tiff, etc) because digital processing is always improving).

When a digital processor talks about increasing the grain in an image, when for example they want to increase the amount of texture on a face, they mean they are carefully controlling noise.

NOTE: all of the quick takes refer to articles that are well worth reading/viewing entire. We own the some good articles. If you want to look at them, we can bring them to other meetings.

<http://www.michaelalmond.com/Articles/noise1.htm> Neat Image is a cheap, but very sophisticated stand-alone program...
<http://www.luminous-landscape.com/reviews/software/neatimage.shtml> also contains a review/demonstration by Michael Almond.
<http://www.techsupportalert.com/best-free-photo-noise-reduction-software.htm> on 6/17/08, Tony wrote a review of Noiseware Community Edition, Halicon Filter and ND Noise. It includes what language and which image the plug-in supports.

TIP: from the **Photoshop Focus Guide on RAW Photo Editing**: “To reduce noise shoot as far to the right as possible without blowing out the highlights.” (*Newbie interpretation: When you take your picture, increase your exposure without overexposing your photograph. You can increase exposure by using a smaller f-stop number-a larger opening-or hold the shutter open longer.*) While watching your histogram, adjust you camera settings to make the curve slide as far to the right as possible without going beyond the right edge of the display. (*Newbie interpretation: If the histogram rests on the bottom line before or as it hits the left or right edge, the exposure is not wasting any information. If the histogram does not reach the bottom before it hits an edge, this is called **clipping**; it is underexposed if on the left and overexposed if on the right.*)

MORE noise about noise for the really intense photogs:

“Noise reduction is the equivalent of [reducing] the static...in AM radio signals.²”

Noise is most often found in high ISO, uniform colors, long exposures and underexposed areas.

Dark Noise comes from heat produced in camera’s sensor.

Random Noise 1 comes from fluctuations within camera’s circuitry and electromagnetic waves on location.

Signal Noise comes from fluctuation in distribution as light strikes the sensor.

Signal-to-noise ratio comes from the ratio of signal strength relative to **Background Noise**.

Amplified Noise comes from using a high ISO.

Accumulative Noise comes from slower shutter speeds.

Fixed-pattern Noise comes from an uneven signal boost among the pixel amplifiers on your sensor.

Random Noise 2 is seen on images taken at different times of the day.

AND is that’s not enough, noise is created during **jpeg transfers!**

Is your head spinning yet? Read on... .

² *Shutterbug* March 2009 Vol 38, #5, Issue 462. “Noise Reduction Comes of Age: Plug-Ins For Getting The Noise Out” Joe Farace.

In-camera on-chip noise suppression varies from manufacturer to manufacturer:

- 📷 Some D-SLRs offer user-selectable noise reduction after capture before it is written on the memory card. Some also some may also offer up to three choices of noise level suppression.
- 📷 On some D-SLRs, Correlated Double Sampling (CDS) allows one signal to be read by two circuits to help reduce noise.
- 📷 In-camera, more power creates more noise. On-chip technology may record noise before exposure then subtract it from the noise in the image when the exposure is completed.

All this said, post-production noise reduction offers some advantages over in-camera reduction because you have more control over when and how it is applied.

Plug-Ins work through a host application so make sure you check that the one you are considering lists your application before purchase [unless you are looking for reasons to buy more software].

“Reduce noise in low-light images”³ is a step by step demonstration for an image taken in RAW using the ARC within Photoshop [and Elements] for image editing.

1. Open the low-light image, to see the noise, set the exposure slider to +1.25, recovery 25, fill light 10, blacks 0, brightness 50, contrast 0.
2. Click and move to the Details page. Set all sliders to 0, preview at 100%.
3. The chromatic noise (British term) shows up as speckles of color, move the slider to remove the speckling as much as you want then use the hand tool to move around to other parts of the image to make sure you have not reduced the noise so much that your waves and other details have vanished.
4. If you over-use the luminance slider, your image will look like a painting rather than a photograph. Set the luminance to about 20.
5. Depending on your image and goals, you may want to study how to sharpen with the sliders on the details page, or wait until you are in Photoshop. Sharpening should generally done last, after the removal of noise satisfies you.
6. Open in Photoshop to fine-tune your image. Begin again with color: move all sliders to 0, preview 100%. If you need to remove more noise, adjust just enough to remove remnants, then use the hand to make sure again that you have not destroyed anything you want to still show on your photograph.
7. To gain more control over the B&W specks, begin at 10, reduce until you are satisfied with the speck removal.
8. In Photoshop, use the preserve detail slider to recover any fine details that has been lost. Work between 6&7 using the hand to check fine details until you are satisfied.
9. Now *carefully* use the sharpening tools in Photoshop to check your finest details, remembering that sharpening may add noise to fine lines.

Note: although JMC uses the tutorial as the guide, she has added one step and some comments

WORKFLOW: To prevent intensifying noise, apply the noise filter early, before you make other changes.

³ *The complete guide to Landscape Photography*, www.futurenet.co.uk “Reduce noise in low-light images” p62-25.

WORKFLOW: Review your images for noise at a minimum scale of 100%. If you have trouble seeing noise even when it is pointed out to you until the image is sized at 300%, use a competition workflow including a noise check at 400%.

WORKFLOW: Color Noise is the most obtrusive so work on it first. It is most apparent in the even tones of images taken with higher ISOs. Color noise is most apparent in the shadows so it is easier to create color noise when correcting underexposed photographs. Correcting for color noise may cause a slight shift in hue.

Luminosity reduces monochromatic noise (200+ ISO) so watch carefully that you do not remove too much detail, that you do not make your image appear flat.

WORKFLOW: 1. Click **Profile Image** on the *Profile page*. This will measure the noise in the image. 2. Adjust the **Luminance Strength** slider on the *Filter page* until you like the results. (3. Go to the Noise Brush page. Paint with the brush tool in the Preview window to protect parts of the image from filtering.) 4. Press the **OK** button to filter the entire image.⁴

WRAP UP:

Each image is different. For example, in a series that includes the sky from the same spot on the same day, some or only one will require noise reduction. A glimpse of the sky at 400% will let you know. If there is sky and water in the image make sure you do not flatten the waves unless you don't care if they show up or not.

By creating this NoiseNinja demo, JMC has gained a better the ability to control her images *to her own satisfaction* for judging.

Using Noise Ninja, I encourage you to **play around with the sliders** when you have the time, before you apply an automatic profile change. There have been very few images that I could see the difference with some sliders, but when sliders do make a difference, they do offer a refined control.

PS: Terry says you can also use something like an HDR technique to create a clear, very low-light image by **sandwiching a series of three** rapid-fire images together as layers in one image, then carefully blend the layers together. (But that is another program, not by a newbie.) Since noise is a random event, the three random captures cancel each other out. However, this requires using a tripod to capture as exact a series as possible.

Bibliography:

Shutterbug July 2008 Vol 37: #9: Issue 454: pp 76-84.

“Tools:Software by Jack Neubart: Quieting Noise: Digital Noise Is Easily Controlled With These Plug-in Filters” Neubart tested Dfine, Neat Image Pro, Noise Ninja Pro and the Noiseware Professional plug-ins for his article.

Shutterbug March 2009 Vol 38: #5: Issue 462: pp 124-128.

“Noise Reduction Comes of Age: Plug-Ins For Getting The Noise Out” Joe Farace.

After a presentation of In Camera Noise Suppression, Farace has a paragraph on post-production Plug-Ins including: Imaginomatic's Noiseware, PictureCode's Noise Ninja, Neat Image, Kodak's GEM, and Adobe Photoshop and Elements.

The complete guide to Landscape Photography, www.futurenet.co.uk “Reduce noise in low-light images” p62-25. This photo-filled tutorial contains excellent step-by-step basics as well as advanced suggestions and a CD.

⁴ Noise Ninja Help: User Guide: 30 seconds.