

## CHAPTER 12 - HIGH DYNAMIC RANGE IMAGES

The most common exposure problem a nature photographer faces is a scene dynamic range that exceeds the capability of the sensor. We will see this in the histogram which may have spikes at both ends. We noted in a previous chapter that under 'quiet light' conditions, most scenes render rather well. The reason most landscapes have a high scene dynamic range is due to the nature of the illumination, not the underlying dynamic range of the objects in the scene.

The darkest natural objects reflect about 5% of the light that strikes them, and the brightest natural objects 95%. This is a 17 fold difference and represents just over 4 stops of reflectivity and is the reason why quiet light scenes photograph so well.

When we add the bright sun as the source of illumination, we have to deal with bright objects in full sun, and dark objects in deep shade. The difference is about 17 stops! No camera today can cope with this brightness range, and neither can any computer display or photo printing paper.

What's curious is that the human eye can manage this range as it adapts to light and shadow almost instantly. And so it is not always obvious when scene dynamic range exceeds the capabilities of the sensor. This is why the histogram is so important.

There are number of ways to cope with this, including simply choosing which parts of the image, shadows or highlights, can be sacrificed. This is usually less than satisfactory. Professional photographers will use a small electronic flash to 'fill' in shadows. This is definitely possible for some nature photography, such as close up work, but is virtually impossible for photographing waterfalls.

However, by using special software, we can make multiple exposures of the same scene and merge them into a new file format, HDR that can hold the entire luminance range. These files must then be converted into standard image formats (JPG, TIFF) for display on a computer or printing. This process is called tone mapping. So a two step process: Merge & Tone Map. All HDR software does both.

I have not used any HDR software that produces a true 'final' image. Rather, the HDR software is part of a total workflow that starts in the camera and ends in a 'final' master image produced in Photoshop. HDR is just one step in this process when required.

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### EXPOSURE BRACKETING

Making multiple exposures of the same scene is part of several photographic techniques that deal with high dynamic range scenes. Landscapes, panoramas, and high dynamic range (HDR) images might all involve multiple exposures at one time or another. Waterfalls will almost always require one of these techniques. When we make multiple exposures of a scene, a tripod is virtually always required. (I have made multiple HDR sequences by stabilizing a point-and-shoot camera against a rock. This requires using image software to align the images pixel-to-pixel. Not very difficult, but it adds more to the work flow.)

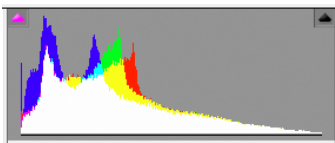
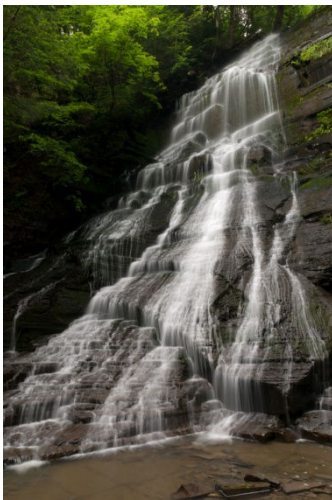
In addition, exposure changes should be made using shutter speed only, once an f/stop has been selected. This is simply because merging images with different depths-of-field loses quality in unsharp areas. Even though moving parts of the image will be affected by the change in shutter speed, some blur in moving objects is expected, certainly for waterfalls.

## TWO FRAME MERGE

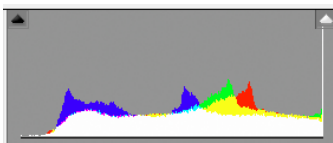
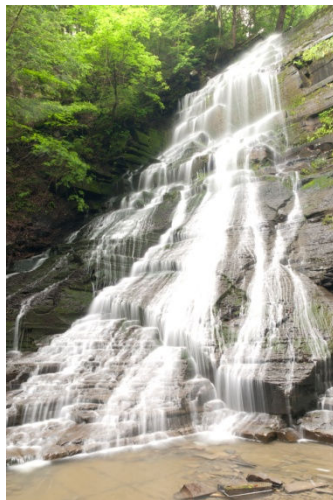
This is an example of an image that required only two exposures, and how these were merged in Photoshop to get a single image with detail in both highlight and shadow. Fortunately, this is a common situation, and the solution is easy. These images were made at Rynex Falls, part of the Plotter Kill Preserve in Schenectady County. The camera was mounted on a tripod and locked down. The suggested exposure was of 2.5 seconds at f/11. I had set f/11 in manual mode (primarily for depth-of-field but also maximum sharpness) and centered the exposure display using shutter speed. There were spikes in the histogram at both ends, but frames at 1 stop under and one stop over removed the spikes.

I selected the two RAW images in Bridge, used the menu command sequence: "Tools, Photoshop, Load Files into Photoshop Layers...". Since the dark image would be the predominant contributor to the final image, I moved the dark layer to the top of the layer stack, then added a mask. I made sure the mask was selected then used a soft brush at 25% opacity to paint black over the dark areas under the trees, and also under the rocks at the lower right. Using black concealed the dark layer allowing the corresponding part of the lighter image to show through. I used multiple strokes of the black brush until I was satisfied with the textures in the shadows.

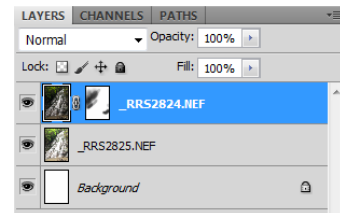
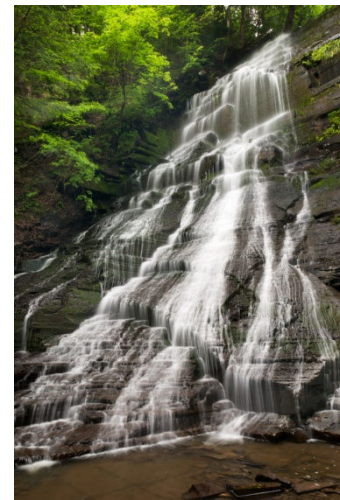
1.25s @ f/11 -1 Stop



5s @ f/11 +1 stop



Layered and Masked



You can see the brush strokes on the layer mask at lower right. If I had applied too much black, I could have used a white brush to 'undo' the excess, or have deleted the mask and started over.

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## MULTI FRAME HDR

Set the camera up on a tripod, frame the image, and lock down the head and legs so the tripod is solidly in position. Our first image is made to get a histogram that is as close to perfect as possible. That is, there may be some clipping in both highlights and shadows, but most of the image falls in the middle. This will be the central exposure in the sequence. I have found that the 'matrix metering' option on my camera does a great job of giving a good starting exposure. If the f/stop and shutter speed the camera suggests does not give a centered histogram, I delete the image and adjust as necessary. When I have an image with a good, centered histogram, I make my next exposure to capture shadows. To do this I use a slower shutter speed, which allows light to hit the sensor longer and builds up values in the shadows. Typically, this is two stops. If the centered image is 1/30 sec, then this one is 1/8 sec. Check the histogram to be sure the shadow clipping is gone. If not, delete and use another stop more light. I take images until I get one where there is no clipping in the shadows, with a small area at the left of the histogram where no pixels fall. Each unsuccessful image is deleted.

The next image will be for the highlight areas of the image. Again, I'm looking for no clipping on the right side of the histogram, with a small gap where no pixels fall. Keep in mind that there will often be some highlight clipping that you cannot avoid. In full sun, any reflection of the sun from shiny objects, a wet rock, a dew drop or the shiny exoskeleton of an insect, will always be clipped.

After this process we have the beginning and ending exposures for a sequence. Set the camera to manual mode and take a series of shots starting with the 1<sup>st</sup> image optimized for shadows, then increase the shutter speed 1 stop until reaching the settings optimized for highlights. My Nikon, and many DSLRs, have a built-in setting for such an exposure bracketing sequence using changes in shutter speed, as desired. With the camera in Manual, and set to the central exposure measurement, I can choose 3, 5, 7 or 9 frames with a 1 stop interval between each. For 3 frames, this would be exposures at -1, 0, +1 stops, or, for 9 frames, exposures at -4, -3, -2, -1, 0, +1, +2, +3, +4 stop. My camera only allows 1 stop intervals; some cameras will allow 2 stop intervals. Either will work just fine.

I use a cable release to make the sequence, with the camera set to continuous shooting mode. This is the mode where the camera keeps taking pictures until you take your finger off the shutter button. The camera actually makes this easy; hold the cable release down and the camera stops taking pictures when the bracketing sequence is done. And conveniently, the camera buffers the images internally and does not write them to the memory card until the sequence is done. This results in the histogram of each image being displayed sequentially. I can then assess whether the histograms meet the requirements above: empty to the left for the 1<sup>st</sup> image, empty to the right for the last image. Way cool!

With practice, making these exposures happens fairly quickly. Most of the time, the adjustments are only 1 to 2 stops in each direction, and no images are deleted. Be careful though, you have to manually reset the bracketing to 0 frames in order to get out of exposure bracketing mode. From experience, I can tell you it's quite easy to forget!

## HDR SOFTWARE

There are several HDR software programs that work well for nature photography. All are available with a trial mode that will let you use them for about 30 days without having to purchase them. They typically add some kind of overlay to your image until you apply a license. Personally I have used 5 different packages and have settled on Photomatix Pro. All are listed in the Appendix. Photomatix will actually allow you to remove the overlay after the trial period.

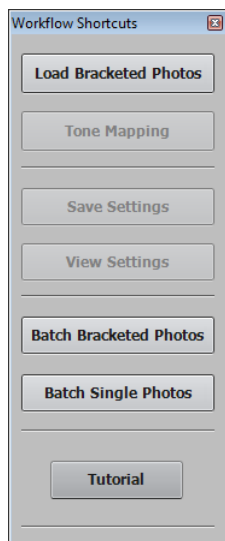
A number of these sites have sample images to download, or create your own sequence, then try them out with each package. I have some sample sequences available on the Wet Boot Photography web site. The images will be in Nikon's raw format (NEF), JPG and TIF; the JPGs and TIFs have been white balanced, and corrected for chromatic

aberration in Photoshop Camera Raw. Some HDR software reads raw files, some does not. It is not necessary to shoot raw images for HDR; JPGs work just fine.

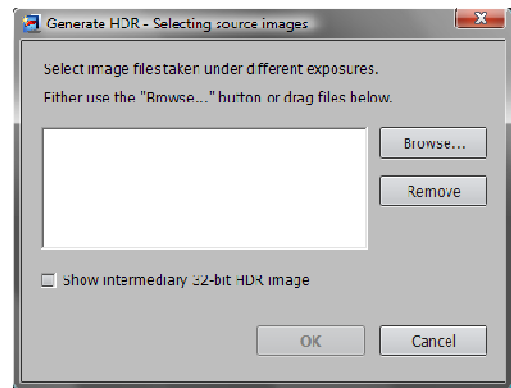
I chose Photomatix Pro because I got excellent results smack out of the box. (I have no relationship with Photomatix; I paid full price for the software. My recommendation is based on results alone.) Surprisingly, there are only a few settings you need to know about to get good results, but you can and should play with the many controls to see what they do. Photomatix has 'default' settings you can fall back on if the image gets too bizarre. You can also save your own custom settings to recall. So no reason not to experiment.

## USING PHOTOMATIX PRO

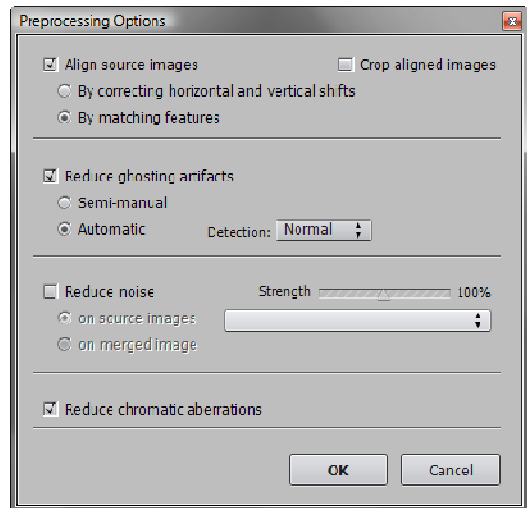
The screen shots shown here are from version 4.0.2. The configuration of controls and dialogs have changed over time as new features were added.



The workflow shortcuts toolbar is shown at left. Choose Load Bracketed Photos. The opening dialog shown at right is used to select and open the image sequence you are working with... just click the browse button. Try the 'Show intermediary 32-bit HDR image' option once or twice. Looks interesting, but you cannot change or modify it, so not much value in showing it every time.



The next dialog lets you choose some options for pre-processing. These you need to know.



**Align source images.** If you use a tripod, you may not need to check this box. The

alignment takes some time and can be skipped if not needed. But I have seen slight shifts in image position even on a tripod. If you see unusual ghosting in a processed image after this step, you may have to reload and use this feature. If you have made you sequence hand-held, you may find that Photomatix is unable to align the images well. (The good news is that Photoshop usually does an excellent job at this. Load your images as layers in a single PSD, align crop and export as single files. This is more fully described in the Photoshop chapter.)

**Reduce ghosting artifacts.** When multiple images are aligned, any object that has moved between frames may produce a ghost in the final image. Typically, ghosts are caused by wind-blown leaves and branches, items floating on moving water, and moving clouds. Photomatix does a good job with the leaves and branches. Harder ghosts are the reflections on water which change with each ripple. Stick with 'Automatic' 'Normal' unless you see a ghost that has not been removed. Choose Semi-manual if ghosting is a problem.

Of course, you will not be aware of ghosting until you have processed the image sequence at least once. You will need to start over and use the de-ghosting tools. I have suggested that software developers at Photomatix allow the file list to remain open so the images do not have to be reloaded from scratch if a second pass is needed, but it has not appeared in any release so far. Fingers crossed!

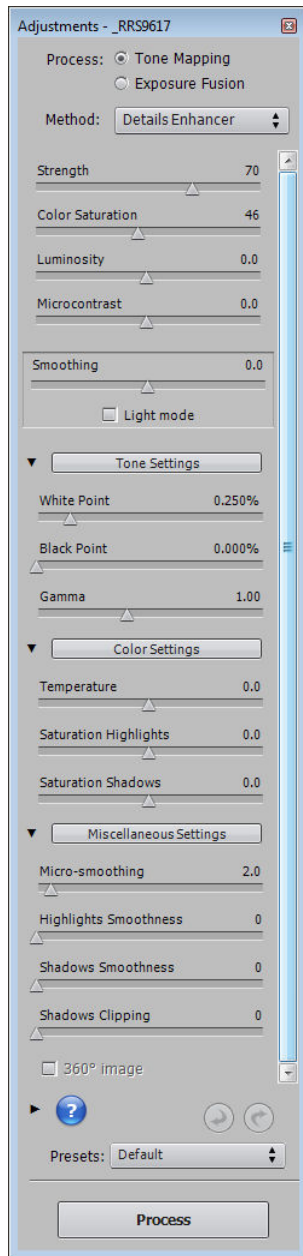
The semi-manual dialog allows you to draw a dotted line around each area where ghosting appears; Photomatix then concentrates on these areas. Be sure to zoom in and out as needed to place your lines.

**Reduce noise.** I have never used this feature! But then I always use the least noisy 'film speed' for my images. But frankly, overlaying multiple images usually reduces noise. Noise occurs randomly in the image and merging images tends to average this out. Noise tends to occur in the darker images, so may be present there even at low ASA settings.

You can use Photomatix to apply an HDR treatment to a single image, or one processed in camera raw multiple times to enhance lights midtones and darks separately. Since the noise in each of these images exactly lines up, noise can be greatly exaggerated.

**Reduce chromatic aberration.** If you have chromatic aberration in your images, use this option. If you capture JPG images with your digital camera, some chromatic aberration is likely. Almost all zoom lenses produce chromatic aberration at some focal lengths if not all. I typically correct chromatic aberration in Photoshop's Camera Raw as part of a raw workflow. Since all the images in an HDR set are photographed at the same focal length, they can be batched processed using identical settings for chromatic aberration. This is described in the Photoshop chapters. After correcting, I save as single layer TIF images for import into Photomatix.

## PHOTOMATIX PROCESSING



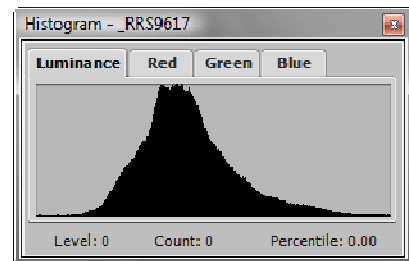
Once the image opens in Photomatix, it is automatically scaled so you can see the whole image, and the main toolbar is displayed on the left of your computer screen. You may also see the histogram display. If not, use the 'View' menu to display it. If you see the presets toolbar, close for now.

Note that the main toolbar is arranged in sections. Each section can collapse, using the small arrow to the left of the section headings. Most computer screens cannot display the entire height of the toolbar. Don't overlook items at the bottom when they are hidden; either collapse some sections, or scroll as needed!

At the top, be sure Tone Mapping is chosen, and the Method is Details Enhancer. You should explore the other settings, but these give you the most control. Occasionally, the Exposure Fusion process gives excellent results so is worth exploring.

At the bottom, be sure Default is selected in the Presets dropdown. (Not Natural! It isn't!) Here are the three key settings you need to know:

**Tone Settings, White Point:** Move the White Point slider to the left until any spikes that appear at the right end of the histogram disappear. It may look dark onscreen, but those spikes will be blocked in the final image.



**Color Settings, Saturation Highlights:** The HDR merge tends to increase saturation, an effect I see more in highlights, but does occur in the Shadows as well. Move sliders to the left to lower saturation. Even in Photoshop, reducing saturation can be difficult.

**Miscellaneous Settings, Highlights Smoothing:** The HDR merge tends to produce halos when there is a strong difference in brightness values across a sharp edge. Typically I see these in clouds or sky above the horizon or tree line. The halo creates a bright area immediately adjacent to the horizon, then transitions to seriously too dark sky or clouds. Moving this slider to the right, sometimes all the way, can eliminate these halos.

You can save these adjustments, and these will appear in your presets toolbar and the Presets drop down at the bottom. But there are only three and I find that most images require somewhat different settings.

Save your image as a TIF. We will edit it more in Photoshop.