

Full Range HDR

We present essential steps to use your DSLR in manual mode to capture the full range of light for your fine art vision. Pictorial examples break this exciting routine in to a series of steps; capture, combination to 32 bit hdr file in Photomatix, global sharpening and tone mapping in Lightroom, and final touches in Photoshop.

We then deduce some corollary conclusions using 14 vs 12 bits to gather more shadow and highlight information.

Most DSLRs provide rudimentary high dynamic range (HDR) raw image capture. Capture is usually helped by Automatic Exposure Bracketing (AEB). AEB expects you to set aperture, ISO, and choose a balanced initial shutter speed. When active, AEB then captures n images at different shutter speeds. In older DSLRs, that may only be 3 images (0, -1EV, and +1EV). Today's professional DSLRs can capture up to 9 images...

Unfortunately, such arbitrary ranges may not include all light available. With Full Range HDR, manual capture is designed to take the entire range of available light using histogram previews to make a more accurate initial series of images. For example, daytime HDR may have data ranges of 10-12 EV. Sunset HDR ranges may range from 16-20 images. So, you can capture all light...

Don't stop there; Full Range HDR allows most DSLRs to compete with more costly professional digital cameras in 'getting that awesome HDR data'!

Full Range HDR Capture	2
<i>Camera Setup</i>	2
Photomatix Pro 3.2.3	3
Save 32 Bit File	3
Tone Compressor's 16 bit 'Tone Mapping'	3
Photoshop Tone Mapping	4
Photomatix - Lackluster Noise Reduction	5
ACR Noise Reduction	5
Compare Original vs HDR Response	6
Here 'Tis	6
Auto Exposure Bracketing (AEB) vs Full Range HDR Capture	8
Deductive Corollary Regarding 12 Bit Capture	8
Conclusions	9

Full Range HDR Capture



This simple HDR image is processed by Photomatix Pro 3.2.3.

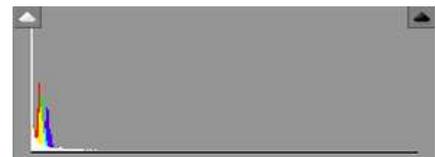
Camera Setup

Nikon D300 on tripod, 14 bit raw file setting, ISO 200, f/11, Δ EV = 0.5 / shutter speed click.

Begin by opening your shutter 6 - 10 clicks (moving main dial left), taking a shot, 'til your highlights histogram fit only shows 10% of light.



Then, 2 clicks at a time, move shutter control right, take each shot (perform raw file capture), 'til only 10% of



your darkest shadows remain.

When you are done, you have captured ALL reflected light into a sequence of raw files which will provide grist for the next 2 important steps - combining to 32 bit HDR and tone mapping 16 bit results.

For Magic Hour capture, your click range may be larger than this noonday example ~ shoot, check your histogram, and choose the initial HDR capture when your histogram resembles the first one above... then finish all dark captures!

Photomatix Pro 3.2.3

Now, we must convert all 16 bit raw images to a single 32 bit .hdr file. For this step, we use PP 3.2. Open PP, select all raw files, and click *Generate HDR Image*.

In this case, after *Selecting Source Images*, you are presented with the following dialog box...

Choose ALL options and click OK.

PP will go away, alerting you as each substep occurs. When done, you get a 32 bit result.

For this particular HDR compilation, a dual CPU 1.8Ghz machine took ~7 minutes to make the 32 bit file.

Save 32 Bit File

I always save this file as 32 bit .hdr - there is little point in repeating work and you may want to process it one of several ways.

Tone Compressor's 16 bit 'Tone Mapping'

As a Magic Hour shooter, I am often faced with light skies and dark foregrounds. Magic Hour produces bi-modal histograms (two humps on histogram - one for sky and one for foreground).

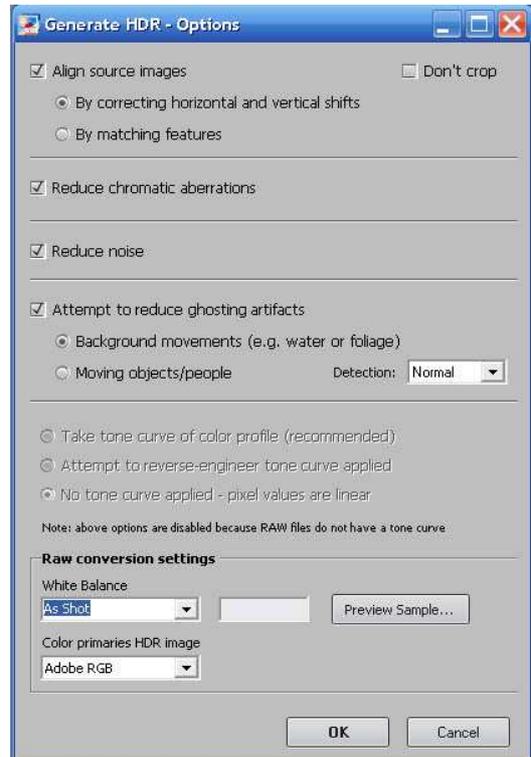
By experiment, I find *Details Enhancer* - primary menu choice in PP - IGNORES bi-modality ~ then produces its own *guesswork* histogram. As a result, I loose the fullness of truly capturing Magic Hour.

With time, I learned to *Tone Compress* at Default settings. This produces a 16 bit tif image - with that *all important* bi-modal histogram still intact. By choosing Default, I ignore PP for the final *Tone Mapping* result - although in PP's misplaced lingo, I have 'Tone Mapped'.

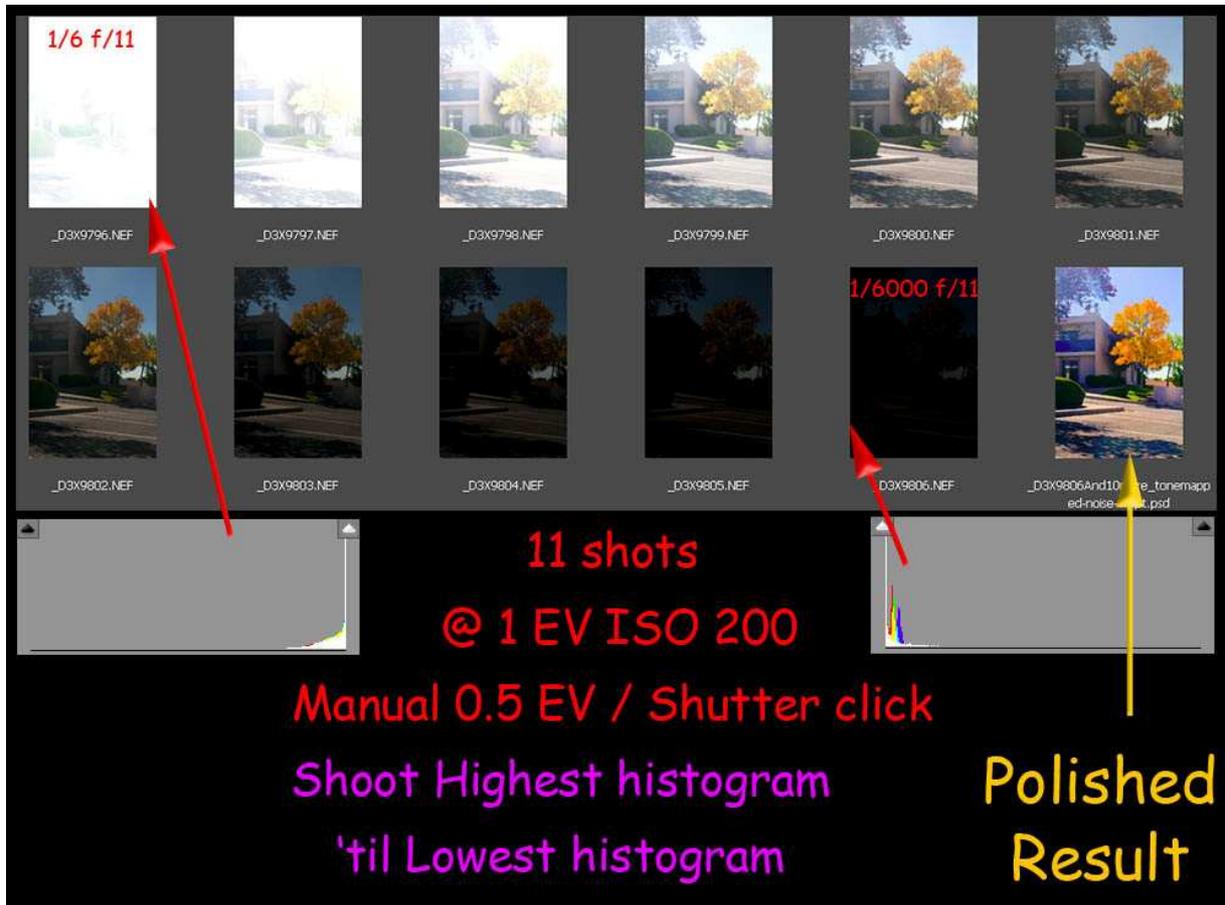
Why?

I plan to rely on Lightroom and Photoshop for any future *Tone Mapping*!

Here is a review of steps from capture of 11 images, to each histogram evaluation for when to start and stop 'rotating shutter dial', and getting a 16 bit tif which LACKS true *Tone Mapping*. I included the finished product to balance info.



This experiment was done @ 11AM. Shutter speeds ranged from 1/6...1/6000, aperture f/11, and ISO 200. In effect, this capture is 11 EV although in broad daylight and containing many images near the end of each histogram spectrum.



Photoshop Tone Mapping

With the 'non-tone mapped PP tif', I can use Adobe Camera Raw's (ACR) setting "open all supported Tif files", which allows me to quickly perform black-white point balance, medium contrast using curves, some enhancements on Recovery and Fill Light for those regions near 12-25% of each histogram end, with Clarity and Vibrance changes in the dialog box before I begin other tone mapping steps.

OR, I can use Lightroom to more easily perform these same steps...

In library mode, choose File>Plug in Extras> Export to Photomatix Pro, again check all boxes in the dialogue, then check export. As a reminder, I use tone compressor at default settings to create the 16 bit tiff. PP places it back in your Lightroom workflow collection.

Photomatix - Lackluster Noise Reduction

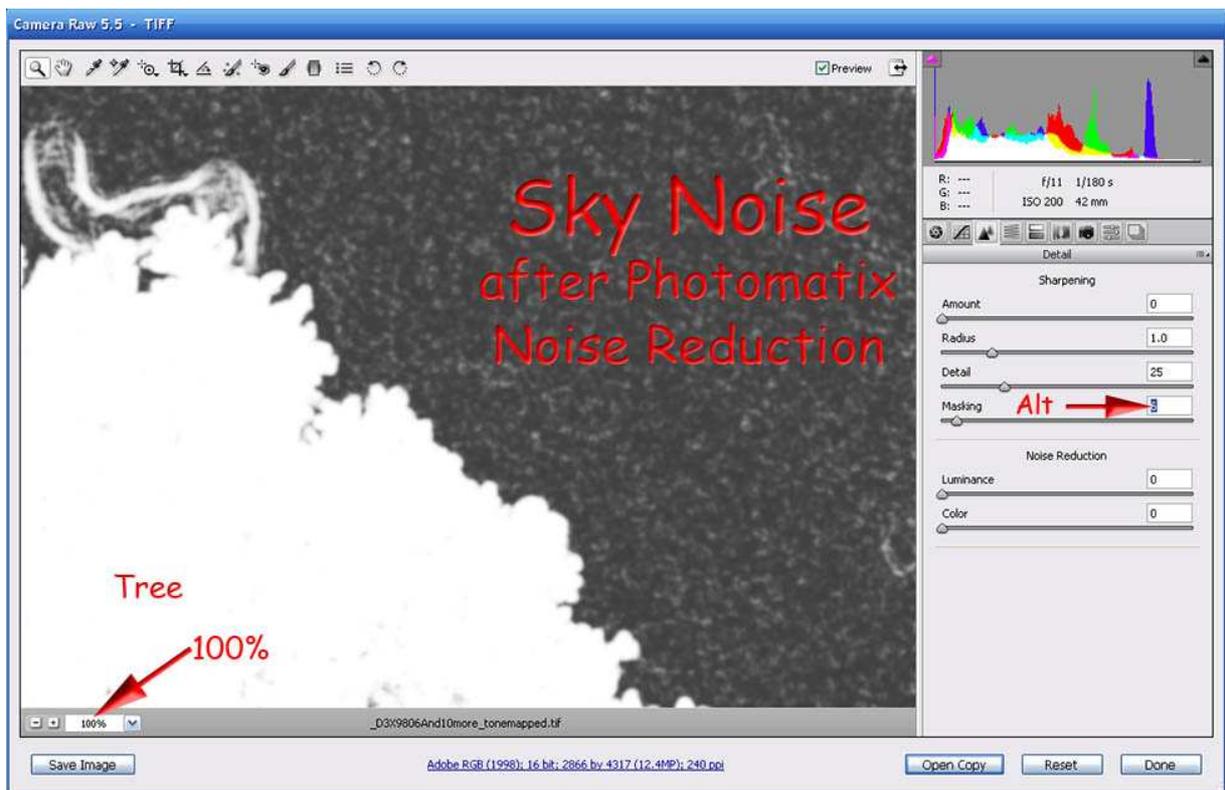
Although PP sez it is reducing noise, I seriously question the depth and efficiency of that algorithm. The following image shows the boundary between tree and sky. I used the lower portion of ACR's Detail Tab to examine for Sky noise. After setting Zoom to 100 %, I pressed the ALT key {PC} and began moving the Masking slider right. If I moved it far enough, speckles in the Sky became pure black (noise removed).

Those speckles are blue and green channel noise in the SKY...

OOPs, Photomatix, which sez it reduced noise, left noise!

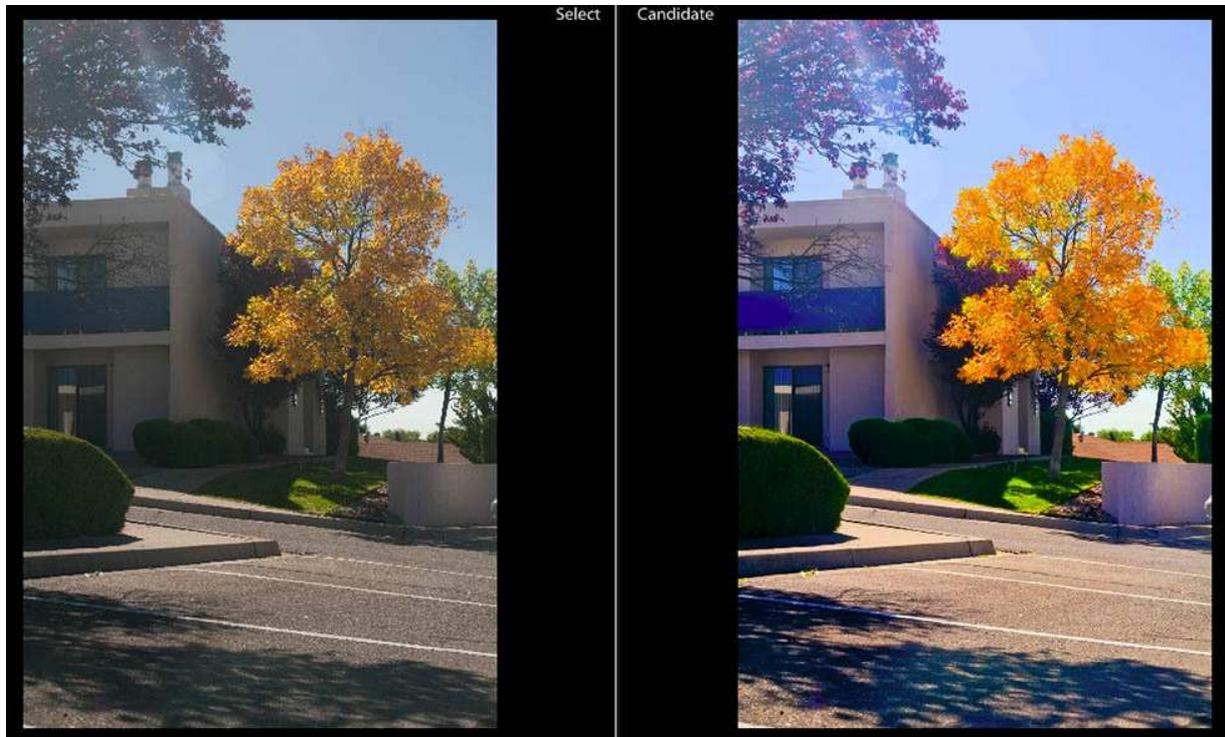
ACR Noise Reduction

Holding the ALT Key, I moved the Luminance noise reduction slider until I effectively masked the noise. For this image, full masking occurs at 50%; you will make your own decisions about what values work for your particular cases.



This ACR noise reduction is global - intricate tree leaves make it a challenge to provide masks which allow me to only remove noise from the sky.

Compare Original vs HDR Response



Lightroom contains a neat feature - showing me Start and Finish images of a particular Tone Mapping sequence in one image.

On the left - original OEV 14 bit raw image.

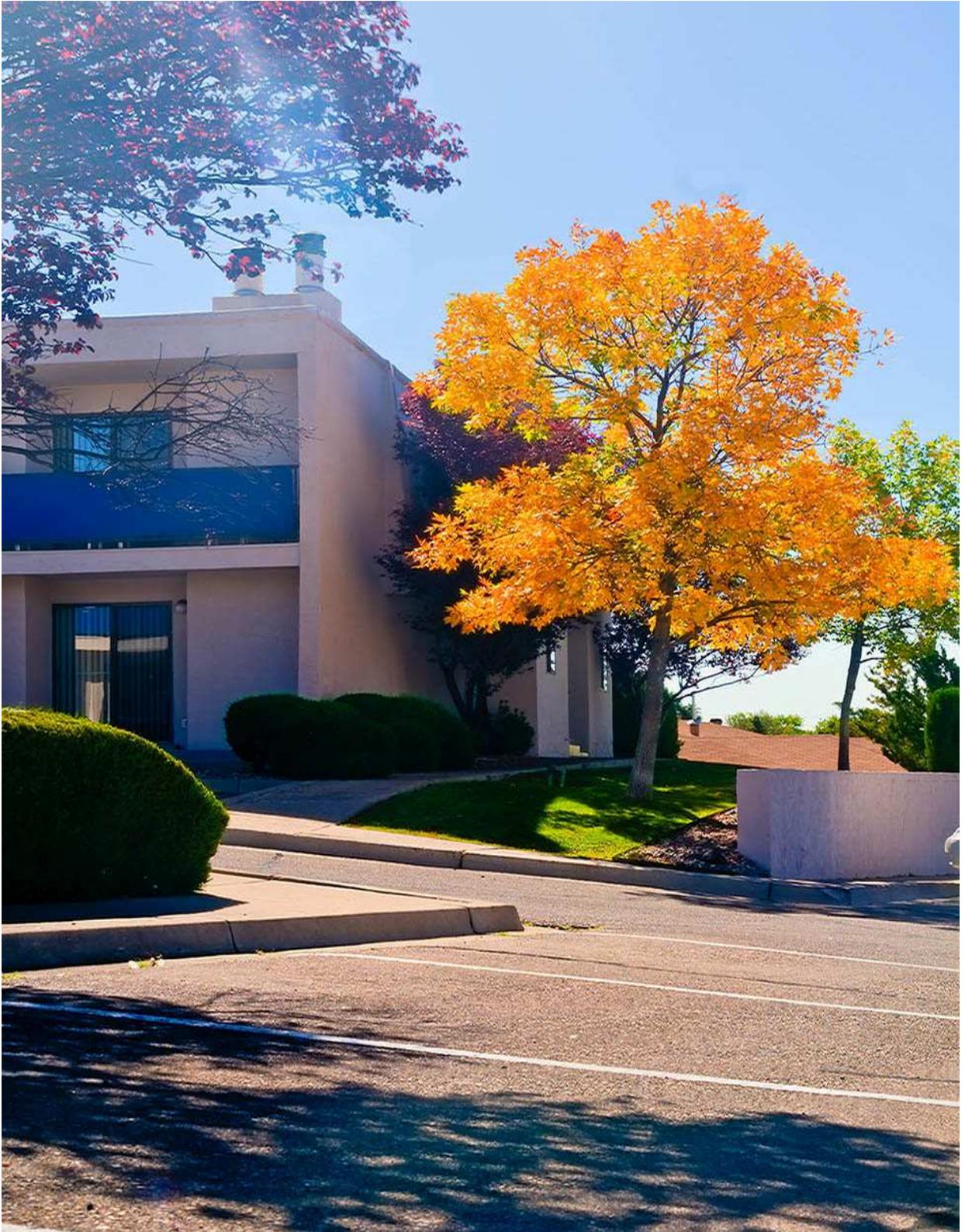
On the right - 11EV jpg from our Tone Map experiment.

Here 'Tis

What intrigues me about this midday HDR shot?

The royal blue of balcony cover, evocative green of lawn, gold of autumnal leaves, and scarlet of purple leaves - but slightly masked by lens flare from the sun. When I walked out to shoot, my eye was *only* on the changing leaves...

But it's the breathtaking range of full color across this image which makes it so evocatively rewarding. From the driveway's delicate glow, deep range of shadows between building and gorgeous tree, subtle shadow changes and reflections on the lower retaining wall from the adjacent white car, and clarity of blinds on the lower floor _to_ a subtle light helping the tree trunk stand out from a dark background bush, and, finally, soft, yet sharp green grass beneath the gorgeous tree, my eye delights in so many subtle pleasures of full range HDR capture and Photoshop tone mapping...



Auto Exposure Bracketing (AEB) vs Full Range HDR Capture

Many cameras have AEB; you select a Δ EV range, then capture 3, 5, 7, or 9 raw files to create that final HDR image. Other cameras show more limited options.



Here is a rather delicate comparison of captured light when you use Full Capture (11EV) or AEB (5EV).

- 5EV only captured light below histogram loss limits - it took 5 shots to go from almost overexposed to almost underexposed.
- 11EV captured the full light range from only a little light left on each end of the histogram (see histograms on page 1).

Delicacy - note the sky, lens flare, and shadow behind autumnal tree. The sky is bluer, shadows darker, corners richer, and shading perhaps -0.5 EV more apparent in 11EV.

Blandness - lens flare and sky are flatter in 5EV. The autumnal tree is more brassy and less distinct in 5EV than 11EV.

These results simply show more tonal depth and range in 11EV vs 5EV.

Deductive Corollary Regarding 12 Bit Capture

Raw files can be 14 or 12 bit for certain DSLRs; 14 for advanced Canon and 14 or 12 for advanced Nikon. One can manually choose the 14 bit setting for D300.

What are advantages of 14 bit raw images?

Simply put - 14 bits allows you to capture 4 times the detail per pixel on a linear sensor in a DSLR.

Here is a diagram of the linear distribution created for 12 and 14 bit sensors.



For 14 bits, half the data is found in the upper 50% of light. Basically, this means both highlights and shadows will capture more subtle variations in tonality.

Corollary

Shooting Full Manual HDR Capture in only 12 bits would significantly limit the dynamic range of existing shadows and highlights for 32 bit HDR by a factor of 4.

Such limiting choices can eliminate richness, texture, and the full range of light available when one seeks subtle, yet truly high contrast tonalities at Magic Hour...

This thought experiment has me convinced; future HDR images will be captured using 14 bits in Full Range HDR by ranging from dark-to-light histogram ends, thus removing artificial yet automatic limits (e.g. 3, 5, 7, or 9 EV AEB) imposed by each DSLR camera.

Conclusions

Our discussion of Full Range HDR provides setup, capture, combination, and tone mapping steps for full high dynamic range digital image processing. It helps to have a semi-professional DSLR with L-Bracket and quick release plates for such projects - sensor range, full manual control, and a stable tripod system with panoramic head quickly allow the diligent photographer to master and use this dynamic process with ease. And, of course, all these steps should be such an automatic part of your repertoire you never think about mere manual machinations - you just watch and catch evocative Magic Hour light for your Fine Art creations...

Be the best you can be...

I thank Sandy Corless for discussions about her experiences with Dan Burkholder's HDR workshops on Full Manual HDR Capture and it's subtle Glow...

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Photomatix now in version 3.2.6

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