The Sharper Image in Landscape Photography

by Peter Guerard

Who Am I?

- Involved in photography for 45+ years.
- Software instructor and course designer for 16+ years.
- Past president of the Charter Oak Photographic Society in West Hartford.
- Owner of Connecticut Scenics® and sells fine-art prints at Arts & Crafts shows and online.
- Develops and presents lectures on the technical aspects of photography.
- Uses Nikon digital cameras and Gitzo tripods.

Introduction

- For intermediate level photographers, this course explores the technical aspects of landscape photography.
- The content is centered around equipment and field techniques that can impact the quality and sharpness of a landscape image.
- Although biased towards Nikon, much of the material is applicable to other camera systems.

Seminar Topics

- Tripods and Tripod Heads
- Viewfinder & Live View
- Depth of Field and Hyperfocal Distance
- Testing Your Lens
- Data Capture – the Sensor
- AF and Focus Confirmation
- In the Field Workflow

Landscape Capture Techniques

- In order of increasing sharpness:
  - Hand-holding
  - Hand-holding with VR or IS
  - Use a tripod and remote release
  - Set aperture for optimum DOF
- In order of critical sharpness:
  - Manual focus through the viewfinder with focus confirmation or
  - Live View with Hoodman Loupe
  - Single point AF

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Essential Gear

- Usually a section on equipment begins with the camera and lens. But given its importance, this seminar starts with the tripod. The routine use of a sturdy tripod almost guarantees quality landscape images.
- Also, if you're looking to upgrade your tripod, or in the market for your first tripod, this section should help.

Essential Gear – the Tripod

- To ensure a sharp image you need a stable platform on which to place your camera/lens system.
- A tripod eliminates any exposure dependency on ISO or shutter speed.
- The tripod must be of sturdy construction to support your heaviest camera/lens option.
- A tripod consists of two separate components: the tripod legs and the tripod head.

The Tripod

- Basic features of a good tripod:
  - Carbon fiber construction.
  - 3 - 4 leg segments with twist leg-locks.
  - No center-column.
- Rubber/spike leg tips.
- Expect to spend $500+ for a tripod alone.
- Recommended brands: Gitzo, Manfrotto, Really Right Stuff (RRS).

Note: If you purchase a center-column make sure it comes with a hook at the bottom.

Tripod Heads

- Tripod head types:
  - 3-way pan-tilt head
  - Ballhead
  - Geared head
- Arca-Swiss quick release system – RRS.
- Built-in spirit levels.
- Expect to spend $200+ for a tripod head.
- Recommended brands: Manfrotto, RRS

Tripod Head Comparison

- Ballhead
  - Pro
    - All-axis adjustment
    - Suitable for sports and fast-moving subjects
    - Arca-Swiss quick release
  - Con
    - All-axis adjustment
    - Most expensive

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- 3-Way Pan-Tilt Head
  - Pro
    - Tripod standard
    - Independent axis adjustment
    - Lease expensive
  - Con
    - Protruding adjustment arms
    - Not suitable for sports or fast-moving subjects
    - Weight restrictions
    - Proprietary quick-release
- Geared Head
  - Pro
    - Independent axis adjustment
    - Micrometer-type adjustment
  - Con
    - Not suitable for sports or fast-moving subjects
    - Weight restrictions
    - Proprietary quick-release

Arca-Swiss Quick-Release System

- The Arca-Swiss (A/S) quick-release system is a V-channel dovetail clamp system, with matching camera and lens plates.
- It allows easy mounting and removal of camera equipment, even in the dark.
- It is the standard quick-release with ballheads.
- Other tripod heads have their own proprietary quick-release system and must be modified.

Arca-Swiss Quick-Release System

- Really Right Stuff (RRS) – a manufacturer of camera and lens plates, A/S clamps, ballheads, tripods, and photographic specialty products – has adopted this quick-release system.
- Non-A/S heads can be easily converted to A/S quick-release system with the attachment of a RRS clamp to the tripod head plate.
- Used by most professional photographers.

L-Bracket

- Source – Really Right Stuff
- Customized A/S interface between the camera body and the tripod head.
- Provides a rigid connection between the camera and the tripod head.
- Allows for an easy format change from horizontal to vertical without altering the tripod's center of gravity.

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Long Lens Brace for Telephotos

- Manufactured by Bogen (Manfrotto):
  - Connects from camera to center column or tripod leg.
  - Vertical compositions difficult.
  - Restricted movement of camera/lens.
- Manufactured by Really Right Stuff (RRS):
  - Cradles camera/lens with a rail.
  - Uses tripod collar for vertical compositions.
  - Unrestricted movement of camera/lens.
- Not for fast moving subjects.

Tripods – In the Field

- Field techniques:
  - Always extend thicker leg segment first.
  - Never raise the center column.
  - Stow the tripod feet-first in vehicle with legs collapsed and A/S clamp tightened.
  - Hang camera bag around tripod legs for extra weight/stability (or hang from center column hook).
- Field workflow:
  - Point one tripod leg towards subject so you can 'step into' the tripod.
  - Extend legs until camera viewfinder is at eyelevel height.
  - Level the tripod / level the camera.
  - Re-tighten all controls.

Tripod Recommendations

- Purchase a tripod tall enough to bring your camera to eye-level with legs fully extended.
- In other words, after you've attached your camera to the tripod head, the camera viewfinder should be at eye-level.
- There should be no need to bend over to center your eye in the camera viewfinder.
- Do not use your center-column to attain this working height; this reduces your tripod to a very expensive monopod.

Summary, So Far

- Topics covered in this section:
  - Tripods and tripod heads
  - Arca-Swiss quick-release system
  - Tripod accessories
  - Tripod field techniques and workflow

- What's next? Sharpness and the camera.

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The Camera

- Any DSLR that supports interchangeable lenses can be used for landscape photography.
- However, there are some desired features that can help in obtaining a sharper image.

Camera Features

- Manual setting of exposure controls
- Viewfinder diopter control
- Manual focus, AF and focus confirmation
- RAW file output
- Tripod thread on bottom of camera
- Exposure bracketing
- Provisions for a remote release
- Live View
- Image playback with histogram display

Recommended Camera Settings

- Base ISO (usually 100 or 200)
- Exposure delay: 1 or 2 seconds
- Rear LCD display: RGB histograms
- Focus confirmation: On
- Exposure Bracketing: On
- Image file type: uncompressed RAW
- Colorspace: Adobe RGB (1998) for rear LCD display.
- Image bit depth: 12 or 14
- In-camera sharpening: 0

Camera Accessories

- For the camera:
  - Remote release w/ timer or intervalometer.
  - RRS L-bracket.
  - Double spirit level in hot shoe.
  - Spare memory cards (or purchase a camera with a dual card slot).
  - Spare rechargeable batteries (or purchase a battery power-pack.
- For the viewfinder:
  - Correctional eyepiece.
  - Eyecup.
  - Eyepiece magnifier.
  - Right-angle viewfinder.
- For the rear LCD:
  - Hoodman loupe.

Note: Some accessories are not available for all cameras.

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Remote Releases
- Offers hands-free release of the shutter - reduces any vibrations.
  - With or without built-in timer.
- Releases with a programmable timer are called intervalometers.
  - DSLR limit is 30 seconds.
  - Intervalometer limit is 99h99m99s.
  - Downside - requires a battery.
- Both use the Bulb shutter speed setting.
- Invaluable for long exposures.

Correctional Eyepieces
- Attaches to the viewfinder via a retaining ring.
- Comes in a variety of positive and negative strengths.
- Extends the range of the viewfinder diopter control.
- Eliminates the need for glasses when viewing the image through the viewfinder.

Note: Always adjust the diopter control prior to focusing your lens.

The Eyepiece Magnifier
- Attaches to the viewfinder.
- Magnifies the central portion of the viewfinder image.
- Has a built-in diopter control.
- Employs its own eyecup for image isolation.
- Hinged to allow normal viewing through the viewfinder, but you lose the advantages of an eyecup.
- Downside – exhibits extreme tunnel-vision.

The Eyecup
- Attaches to the viewfinder.
- Prevents extraneous light from interfering with the image – invaluable for DOF preview.
- As a compositional aid, allows for isolation of the image.
- Rubber construction acts as a soft surface for eyeglass wearers.
- Folds back against the camera for storage.
- Allows the use of correctional eyepiece lenses.

Right-Angle Finder
- Attaches to the viewfinder
- Allows for viewing and focusing of subjects directly above you without having to raise the center column or bending over to view the image in the viewfinder.
- Has a built-in diopter control.
- Employs its own eyecup for image isolation.
- Has two magnification settings.

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Shutter Release Modes
- We've talked about a sturdy tripod and tripod heads.
- There is another source of an un-sharp image: internal camera vibrations due to the reflex mirror and the shutter – use mirror lock-up.
- It is one of several shutter release modes available.

Shutter Release Modes
- S – Single Shutter Release.
- C_L – Continuous Low.
- C_H – Continuous High.
- M_{UP} – Mirror Lock-up.
- M* – Extreme Long Exposure

Mirror Lock-Up
- Cameras are most susceptible between 1/15 and 1 second shutter speed.
- Shutter cycle is triggered after the mirror has been held motionless against the base of the viewfinder prism for a short time interval.
- Useful if a remote release not available.
- Other methods to reduce shutter vibration:
  - Exposure Delay menu option, self-timer, or Live View.

Focusing
- Accurate focus obviously impacts the sharpness of your image. The assumption in this lecture is the use of manual focus to achieve a sharp landscape image.
- This section explores which focusing method, Viewfinder or Live View, is best suited for your. workflow. Then continuing with a quick dive into AF basics as a focusing aid.

The Viewfinder
- The standard method for viewing an image.
- Uses TTL viewing and a glass pentaprism for a bright image.
- Allows for a variety of attachments.
- Has a diopter control for a sharp image
- Displays exposure and camera settings
- Viewfinder shutter curtain available on some cameras.

Note: Always adjust the diopter control before focusing the lens.

Live View (LV)
- Compositional alternative to the viewfinder.
- Enables a direct view of sensor output.
- Simulates exposure settings.
- Available as a focusing aid using the zoom function.
- Allows viewing of depth of field.
- Automatically employs mirror lock-up.
- However...the downside of using LV:

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- Moderate drain on the batteries.
- Not usable in bright environments.
- Not all camera settings are displayed.
- Unlike the viewfinder, there is only one major accessory: the Hoodman Loupe.

Note: The rear LCD image is not to be used to evaluate color exposure. Use the RGB histograms for this.

The Hoodman Loupe

- Used in conjunction with Live View:
  - Size variations for different LCD diagonals.
  - Isolates LV image from external light.
  - Contains a built-in image magnifier with adjustable diopter.
  - Newer versions are collapsible.
  - Comes with a lanyard and a case.
- However not a hands-free operation:
  - Pressure on rear LCD introduces vibrations which compromises accurate focusing.
- Hoodman offers two solutions:
  - Hoodman Cinema Strap:
    - An inexpensive accessory that attaches to the Hoodman Loupe and then to the DSLR with stretchable cords.
  - Hoodman Crane:
    - A hot shoe mounted accessory that allows a magnified view of the LCD, yet swings out of the way for normal camera operation.
    - Hands-free and vibrationless process

Viewfinder vs. Live View

- We've discussed the functionality and usage of the viewfinder and Live View.
- Using manual focusing, we will now compare image sharpness between the viewfinder and Live View.
- Later we will do the same test comparing AF through the viewfinder (phase-detect AF) and AF with Live View (contrast-detect AF).

Test Target

- You need a test target that's easy to make.
- Using a word processor, create a document whose page size is the largest paper size your printer can handle; 13x19 or 17x22.
- Select a sans-serif 8pt font, like Arial.
- Choose landscape orientation, narrow borders, and full justify for the text.
- Type the alphabet in lower case.
- Use copy/paste until you fill the entire line and entire page.

abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz

- Print the document on matte or plain paper to reduce any surface reflections or hot spots from your light source – don't use glossy paper.

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- Save the document for future use.
- If possible, mount the test target on a piece of thick matte board (8-ply) to ensure flatness or tape the target to a wall.

Set-Up
- Attach the test target to a wall in landscape (not portrait) orientation.
- Make sure the target is parallel to your camera; this is important!
- Move close enough so the target fills the frame.
- The center of the test target should align to the center of the viewfinder (or Live View).
- The test target should be evenly lit.
- Use a sharp lens, such as a macro, and set the aperture to wide open.

My Set-Up
- Test target was printed on 17x22" Luster paper and mounted on 20x24 8-ply matte board.
- Gray ProPanels were used as a background and were vertically leveled.
- Test target was attached to the panels using Velcro corners.
- The tripod is 6' from the panels and leveled.
- Camera mounted on tripod and leveled.
- Lit by a single 250W tungsten bulb and studio umbrella positioned close to the camera.

Viewfinder Test
- Set the camera to Manual focus.
- Adjust the viewfinder diopter control.
- Set the lens at the widest aperture, set the focus to infinity and manually back focus using the viewfinder until image is sharp.
- Use mirror lock-up to reduce any vibrations.
- Release the shutter with a remote cable.
- View the image at 100% in PS or LR.

Live View Test
- Set the camera to Manual focus
- Set the lens at the widest aperture, set the focus to infinity and manually back focus using Live View and a Hoodman Loupe until the image is sharp.
- Release the shutter with a remote cable.
- View the image at 100% in PS or LR.

Analyzing the Results
- In a perfect world, the comparison between the Viewfinder and Live View should be the same.
- My results show a slightly sharper image using manual focus and Live View.
- Reasons for the difference:
  - The mirror and/or viewfinder might be slightly out of alignment, or
  - Sloppy workflow

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• I still prefer using the Viewfinder instead of Live View – personal bias.

Cleaning Your Equipment
• It's a fact of life: dust and dirt is everywhere.
• Simple preventive maintenance will help in the longevity of your equipment.
• Do not be afraid of cleaning your sensor.
• When not using your equipment, always store it with body caps and lens caps.
• I recommend the Visible Dust system for cleaning your sensor.

Summary, So Far
• Tripod usage in landscape photography.
• Camera settings and accessories, and testing the accuracy of the viewfinder vs. Live View.

• What's next? Lenses.

Lenses & Landscape Photography
• You can use any lens to take a landscape photo.
• However, to match today's high resolution sensors, purchase the 'top of the line' lenses offered by camera manufacturer instead of the consumer variety.
• For Nikon and Canon uses, this means Nikon AFS and Canon 'L' lenses.

Landscape Lenses
• Lenses used in landscape photography can be either manual focus or auto-focus with a manual focus option.
• These two lenses should satisfy 95% of your imaging needs:
  • Medium wide-angle zoom: 24-70
  • Medium telephoto zoom: 70-200
• Separate zoom and focusing controls preferred.
• VR or IS not necessary since you are using a tripod.

Zoom Characteristics
• Constant aperture and focus as you zoom are desirable features in a zoom lens.
• However, most zoom lenses today do not hold focus as you zoom, relying on AF to hold focus.
• With consumer lenses, the aperture changes as you zoom. This keeps down the size, weight and expense of the lens.

Choosing a Lens
• Most landscapes are shot at f/8 or f/11, so don't immediately consider a constant, fast aperture zoom.
• Yes, a faster lens means:
  • Easier to focus – shallow DOF.
  • A brighter image in the viewfinder.
  • Allows for a lower ISO or faster shutter speed.

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- However, a faster lens is heavier, more expensive with a possible larger filter size.
- Other lenses to consider for extending your focal length range:
  - Wider-angle zoom: 12-24, 14-24, 16-35
  - Longer telephoto zoom: 70-300, 80-400
  - 1.4x Tele-converter.

Note: Always use the recommended converter for your zoom. Opt for a 1.4x verses a 2x converter, and never stack your converters.

Choosing a Lens – Summary
- Always try to use the manufacturer's lens.
  - Ensures electronic compatibility.
- If there is a choice between consumer and pro lenses always choose the pro version.
- Purchase new from an authorized dealer with a manufacturer's extended warranty, if offered.
- Never purchase gray market or from eBay.
- Wait three months after the lens is released.
- Some third-party lenses are excellent – Sigma.
- Consider buying used: KEH

Lens Apertures
- All lenses are viewed wide-open.
- This is called TTL (through the lens) viewing.
- Along with shutter speed, lens apertures control exposure.
- Lens apertures also control what's in focus, called Depth of Field or DOF.

Depth of Field (DOF)
- All landscape images are expected to be sharp from the foreground to the background, with the foreground taking priority.
- DOF is the range of sharp focus at a given lens aperture and focal length.
- DOF increases as the aperture decreases, but be aware of image-softening diffraction effects at the smaller apertures.

DOF Viewing
- Because you are viewing your TTL images at the widest aperture, it is difficult to perceive the DOF.
- You could turn on LV and try to see the DOF effect as you stop your lens down to f/8.
- Or you could use either of two photography standards:
  - f/8 and be there! or
  - Focus 1/3 of the way from the bottom of the frame and set your aperture to f/8 – the sweet part of the lens.

DOF Preview Button
- All these rules of thumb do not guarantee sharp focus from foreground to background.
- One way to actually see the DOF is to use the DOF Preview button on the camera.

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- It stops the lens down to the taking aperture as long as you maintain pressure on the preview button.
- The image in the viewfinder dims – give your eyes about 5 seconds to adapt.
- An eyecup helps to adjust to the dim image.

Depth of Field (DOF)

- If your camera doesn't have a DOF preview button, then another option is to use Live View and hyperfocal distance imaging (HFDI) to determine your optimum focus point.
- HFDI is useful if you are using a wide-angle lens of 40mm or less and there is a foreground area you wish to have in sharp focus; otherwise just use f/8 or f/11.

Hyperfocal Distance Imaging

- HFDI guarantees everything will be in sharp focus from foreground to background as long as your lens is set to the optimum focusing distance for a given aperture.
- This optimum focusing distance can be obtained from DOF charts or a DOF app on your iPad.

Summary So Far…

- Creating a simple test target.
- Testing focus sharpness between Live View and the viewfinder.
- Depth of field and the various ways to determine the optimum focus setting:
  - Using the sweet spot of the lens – f/8.
  - Focusing 1/3 of the way into the image.
  - DOF Preview button.
  - Hyperfocal Distance Imaging.

- What's next? Testing the lens.

Lens Testing

- Many photographers ask the same question: Which aperture on my lens is the sharpest?
- Simple lens testing workflow:
  - Mount your camera and lens on a tripod
  - For this test we want a real-world example, therefore shoot an outdoor scene at various lens apertures: 2.8, 4, 5.6, 8, 11, 16, 22.
  - Open the images in PS or LR and examine at 100%.

- I now know that when using this 24-70/2.8 at 24mm, I would select an aperture of f/11.
- You would do the same test for the other major focal lengths (28, 35, 50, 70) in the zoom range.
- Unfortunately you end up spending your time testing your lenses instead of shooting. There are web sites for that.

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Lens Accessories
- Use the recommended lens shade.
- Front and rear lens caps on all lenses.
- RRS lens plate on lenses with a tripod collar.
- Replace manufacturer's tripod collar with RRS tripod collar:
  - Smoother operation when changing from horizontal to vertical orientation.
  - Provides a more solid connection to the tripod head.
  - Has its own A/S lens plate.

Lens Cleaning
- Cleaning techniques (in order of impact):
  - Air blower with brush.
  - Compressed air.
  - Micro-fiber cloth or Visible Dust Butterfly.
  - Breathe on the lens then wipe clean.
  - Lens cleaning solution (last resort).
- Keep lens caps on when not in use.
- Store lenses 'front element down' in bag and label the rear lens cap.

Filters
- Polarizing filter on each lens.
  - Polarizer characteristics:
    - Maximum polarization occurs 90º from the sun's position in the sky.
    - The width of sky polarization is 30º.
- Neutral Density – ND 3.0 filter (10 stops).
  - Recommendation: B+W – no color cast.
- Refrain from stacking filters.
- Remove unnecessary filters such as UV or skylight filters.

Filter Testing
- We've tested the camera and both viewing systems, now we're going test the effect of a filter on image sharpness.
- The filter we will test is a polarizing filter.
- It is a complex filter made up of polarizing material sandwiched between two pieces of glass.
- Set the lens at the widest aperture and use the same testing procedure as before.
- Result: A very slight degradation with polarizer.

Lens Flare
- Wide-angle lenses are susceptible to lens flare from bright light sources, like the sun, that are hitting the front element.
- Some remedies:
  - Find a better camera angle and/or choose a less wide lens.
  - Select a smaller aperture.
  - Use your hand, hat or gray card to block the light source.

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- Remove it in LR or PS (difficult at best).

Lens Usage Summary

- Avoid small apertures: f/16, f/22…
- Determine the sharpest aperture for each lens.
  - For a zoom, at major focal lengths.
- Turn off the camera before changing lenses.
- VR control set to Off.
- Beware of lens flare with wide-angle lenses.
- Keep lens caps on lenses when not in use and store face-down in camera bag.
- Clean and inspect lenses and filters after use.

The Sensor

- Digital photography is an information game – the more data you can capture, the more information is available for imaging.
- The sensor is a complex device that captures the light as data.
- Each sensor is divided up into photosites where light collection takes place. The more photosites, the more captured data.
- Most camera sensors require an anti-aliasing filter to reduce digital effects:
  - This filter slightly blurs the image.
  - Sharpness settings in ARC are used to restore this inherent softness.
- Some cameras no longer have an anti-aliasing filter in front of the sensor, which results in a sharper image.
- A second filter used in sensors is called a Bayer filter and is located below the anti-aliasing filter.
- It is a colored filter array (CFA) that assigns an RGB color value to each photosite.
  - This is called demosaicing.

What Is a Histogram?

- A graphical representation of the tonal range of a scene; it is the sensor's light meter.
- For a JPEG shown on the rear LCD, the number of tones displayed range from 0 (black) to 255 (white).
- Each histogram peak represents the amount of light captured with that tonal value. This is called tone-mapping.
- Why 0 - 255?
- Again, the image displayed on the rear LCD is a JPEG representation of the RAW capture.
- JPEGs are usually 8-bit files.
- 8-bit means 2^8 = 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 which equals 256 (0 - 255) tones.
- The JPEG shown on the rear LCD is not a good representation of exposure or color.
- A well-exposed image is where most of the histogram is in the middle of the display – the midtones.
- If you have the option, display all three RGB histograms. This will show you any over-exposure or 'clipping' of a color channel.

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The Sensor & Exposure

- Good exposure is important to the tone-mapping process.
- Two factors critical to optimal data capture:
  - The contrast range of the scene in f/stops.
  - The dynamic range of the sensor in f/stops.
- Dynamic range of the sensor should exceed or be equal to contrast range of the scene.

Note: The dynamic range of your camera can be found at the DxOMark website.

- To determine contrast range of a scene, use your camera in the spotmeter mode, or a hand-held spotmeter, to meter the brightest and darkest areas of the scene.
- The difference in f/stops is the contrast range of the scene.

Note: As the ISO increases, the dynamic range of your camera decreases.

- If the contrast range of the scene is greater than the dynamic range of the camera:
  - In the field, use GND filters to compress the contrast range of the scene, or
  - Bracket your exposures, then in PS or LR use HDR to blend the images to capture all the tonal values.
- If the contrast range is less than the dynamic range of the camera:
  - Over-expose your image until the histogram just touches the right wall.
  - This is called ETTR – Expose to the Right.
  - The 'over-exposed' image is then adjusted in ARC.
  - ETTR maximizes data capture and minimizes noise in the shadows.

The Sensor & Noise

- Sensor noise is the results of three factors:
  - High ISO.
  - Underexposure.
  - Sensor heating due to long exposures.
- Most noise is apparent in the shadows as color noise or luminance noise – it gives the appearance of an unsharp image.
- Use ETTR where possible.

Data Capture & Bit Depth

- Bit depth refers to the amount of data in each RGB color channel.
- Each bit has two values: 0 and 1.
- Bit depth is usually shown as a power of 2.
- 2^8 means 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 = 256.
- Because there are three color channels, an 8-bit device or file type can accommodate 256 x 256 x 256 or 16,777,216 color combinations.

- Cameras capture either 12 or 14 bits of data per color channel.
- A bit depth of 14 means 2^{14} or 4.398 trillion color combinations.

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- After processing the RAW file in ARC, the bit depth is changed to 16, based on an ARC preference.
- A bit-depth of 16 means: 2^{16} = 65,568 colors and 218 trillion color combinations.

Color Space
- sRGB: small gamut designed for image competition, email, ProShow, PowerPoint and most consumer monitors.
- Adobe RGB (1998): medium gamut; standard for most consumer applications, printers and some professional monitors.
- ProPhoto RGB: very large color gamut for TIFF files. No devices currently support this color space.

Data Capture & Bit Depth
- Not all color spaces (or file types) can accommodate 218 trillion color combinations.
- By comparison, if sRGB is a pint, then Adobe RGB is a quart, and ProPhoto RGB is a gallon.
- Set ARC preference to ProPhoto RGB to maximize the captured data of the RAW file.

RAW vs. JPEG

Characteristic	**JPEG**	**RAW**
Bit Depth	8	8, 16, 32
Color Space	sRGB, Adobe RGB	All
Non-Destructive Editing	No	Yes
RAW Converter	No	Yes
File Contents	Image	Data
Hard Drive Storage Impact	Low	High
Rear LCD Display	Yes	No
Camera Color Controls	Yes	No

File Recommendations
- Shoot RAW!
- Set camera bit depth to 12 or 14.
- Set ARC color space to Pro Photo RGB.
- Convert to 16-bit in Adobe RAW Converter.
- Save output as 16-bit TIFF file.

Note: The larger the bit depth, the more data, more detail and greater apparent sharpness when the image is later cropped or printed.

Using Auto-Focus

AF and a Sharp Image
- This section discusses the use of AF in landscape photography.
- It is important that you understand how AF works in your camera as it will impact your workflow and image sharpness in the field.

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- Sit down with your camera and thoroughly read your camera manual or a book written by a third-party; it is time well spent.
- See the references at the end of the seminar.
- Because of the static nature of landscape photography, Single-Point AF is recommended.
- With the camera meter active, you can move your sensor area to any location within the sensor pattern using the multi-selector on the back of your camera.
  - It functions as a joy-stick.
- This helps in reducing the need to recompose the image after focus is achieved.

AF and Landscape Photography

- Three things are necessary for AF to work:
  - Sufficient light
  - Subject contrast
  - Distinct lines
- Your camera should be set to lock focus at the time you partially depress the shutter release. This is called AF-S or Single Servo AF.

Auto-Focus Modes

- The Viewfinder uses Phase Detect and a partially-depressed shutter release button to achieve focus.
  - Image capture is by further depressing the shutter release button on the remote cable.
- Live View uses Contrast Detect and the AF back-button to achieve focus.
  - Image capture is through the shutter release on the remote cable.
- Inherent problems:
  - AF focusing systems rely on detecting lines and textures.
  - Grass and leaves pop right into focus while it searches for a focus point if pointed at a blue sky.
  - Because a minimum amount of light is necessary to achieve focus, alternative lighting methods are needed for night photography.

Single Point AF

- The risk with single point AF is that not all sensor areas, or focus points, determine subject focus in the same manner.
- Some focus points use horizontal and vertical lines to find focus, others only horizontal lines, still others only vertical lines.
- Availability of using certain focus points will be restricted based on effective aperture of the lens.
- Because not all focus points are created equal, this can become a serious issue under two conditions:
  - Shallow depth of field, for example, macro or telephoto imaging.
  - Recomposing after focusing.
- In your imaging workflow, final focusing is the last step before releasing the shutter and capturing the image.

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Testing Your Sensor

- In the viewfinder, the most helpful focusing aid is the Focus Confirmation indicator.
- Before you can rely on the accuracy of Focus Confirmation, some testing needs to be done.
- The following topics will be presented:
  - Creating and setting up a target
  - Camera/lens settings
  - Testing the sensor
  - Examining the output

Test Target

- Use the same test target and set-up that was previously used for the comparison between the viewfinder and Live View.
- We will only be testing Focus Confirmation with the Viewfinder, because with Live View WYSIWYG.
- My preference to manually focus through the viewfinder is a 40+ year habit.

Camera/Lens Settings for Testing

- Camera set to base ISO - 100
- Camera Focus Mode set to Single-Point AF
- VR (or IS), if any, set to OFF
- Metering pattern set to Spotmeter
- Meter mode set to Manual
- Lens shade, but no filtration
- Lens aperture wide open

Phase Detect Workflow

- Adjust viewfinder diopter control until focusing screen is sharp; use an eyecup.
- Position sensor to right-most sensor area.
- Set lens to infinity - critical step!
- Partially press shutter release button on the remote cable to focus.
- When Focus Confirmation is indicated, further depress shutter release button to capture the image.
- Repeat workflow for center and left-most sensor areas.
- Bring each image individually into ARC and color-correct if necessary.
- Save as a TIFF file in a folder and give it a unique file name.
- Open all three images in Photoshop and examine at 100%.
- All images should exhibit equal sharpness.

Sensor Test Conclusion

- Now that we have determined that the sensors in our camera are functioning properly with regards to auto-focus through the viewfinder, we can assume Focus Confirmation is also accurate.
- I use Focus Confirmation and manual focus through the viewfinder to acquire accurate focus.

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Sensor Test Problems

- If you find any sensor is not sharp, especially the center sensor, these are your alternatives:
  - Send the camera in for repair.
  - Document the procedure used for the test.
  - Include a copy of the procedure along with the output files.
- Remember, manual focus is always available through the viewfinder.

Spotmetering and AF

- Most landscape photographers will leave their meters set to matrix or evaluative.
- However, in the spotmeter mode, you can move the metering area, as you can the focus point, to determine the exposure for that area.
- The spot that's being metered is a little larger than the active sensor but still gives you an approximate 1º spotmeter.

The Sensor – Summary

- Shoot RAW images.
- Shoot at the camera's optimal ISO.
- Set ARC bit depth to 16.
- Set color space in ARC to ProPhoto RGB.
- Compare the contrast range of the scene to the dynamic range of the camera.
- Expose using ETTR or HDR strategy.
- Purchase a camera without an anti-aliasing filter.

In the Field Workflow

- Stabilize the camera/lens system using a quality tripod and tripod head.
- Optimize the camera and lens settings for exposure; bracket if necessary.
- Use HFDI to ensure foreground to background sharpness.
- Compose your image.
- Use Focus Confirmation and Single-Point AF.
- Release the shutter with a remote cable and use shutter delay.

Seminar Topics

- Tripods and Tripod Heads
- Viewfinder & Live View
- Depth of Field and Hyperfocal Distance
- Testing Your Lens
- Data Capture – the Sensor
- AF and Focus Confirmation
- In the Field Workflow

Some Abbreviations

- ARC: Adobe Camera Raw
- AF: Auto-Focus
- A/S: Arca-Swiss

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• CF: Compact Flash Memory Card
• CFA: Colored Filter Array
• DOF: Depth of Field
• DSLR: Digital Single-Lens Reflex (camera)
• ETTR: Expose to the Right
• GND: Graduated Neutral Density
• HDR: High Dynamic Range
• HFDI: Hyperfocal Distance Imaging
• IS: Image Stabilization (Canon)
• LCD: Liquid Crystal Display
• LV: Live View
• MF: Manual Focus
• ND: Neutral Density
• PS, LR, BR: Photoshop, Lightroom, Bridge
• RRS: Really Right Stuff
• TTL: Through the Lens
• VR: Vibration Reduction (Nikon)

Equipment Resources
• Tripods & Tripod Heads: Manfrotto (Bogen & Gitzo) and Really Right Stuff (RRS)
• Cameras & Lenses: B&H, Hunt's
• Live View Loupe and Crane: Hoodman
• Arca-Swiss (A/S) Accessories: RRS
• Camera L-Bracket: RRS
• Remote Cable & Intervalometer: B&H, Hunt's
• Double-Spirit Level: B&H, Hunt's
• Tripod Leg Wraps: B&H, Hunt's

References
• Your camera manual – download PDF copy from the manufacturer.
• Specific camera reference books published by Rocky Nook.
• Specific Nikon camera reference books authored by Thom Hogan (PDF).
• *The Nikon Autofocus System* by Mike Hagen.

Other Available Courses
• Intro to Panoramic Photography
• Photographing the Sun
• Introduction to Landscape Photography
• Image Resolution & Print Quality
• Using Telephoto Lenses
• Introduction to Exposure
• More courses in preparation…

• For course details, see my website: www.ct-scenics.com

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