Getting it Right the First Time

- **Taking great pictures - What does it take?**
  - A lot has changed with digital photography but mostly it is exactly the same.
  - You have to get yourself to your subject - and this might require hours of research and planning followed by hours of travel and sometimes hours of hiking with heavy equipment.
  - When you find your subject, you have to imagine the image you want to capture, and then compose and expose the image correctly.
  - When you return from your adventures, you have to finish your images with post-processing techniques that will insure the best possible outcome.
  - Basically, you need to use every tool you have at your disposal, at every step of the process, to ensure the best possible outcome - including planning, equipment choices, proper technique and post capture optimization.

- **Equipment**
  - Great equipment does not guarantee great images. It is much better to have good photographic technique and average equipment than to have average photographic technique and great equipment.

- **Digital Cameras/lenses**
  - Crop Sensors – great for wildlife not as good for macro and scenics. The sensor is smaller than the size of a 35mm slide or negative, which most lenses were designed for, producing a crop factor or effective magnification of 1.5 - 1.6, increasing the affective focal length of lenses.
  - Full Frame Sensor – great for macro and scenics. The sensor is the same size as legacy 35mm film cameras. Wide Angle and macro lenses will produce the focal length and angle of view they were originally designed to do.
  - If you can use the most appropriate focal length lens to get the image size you want, without post-processing cropping, then the mega pixel count is not as important.

- **Tripod**
  - We originally thought that digital photography would free us from having to lug around tripods. We did this for about a year (unless we were using big lenses or shooting macros). Now, we often travel with as many as 4 tripods and heads.
  - Tripods really help with composition, keeping the horizon level and allowing the use of smaller apertures and slower shutter speeds for increased depth of field.
  - They are also essential for some of the techniques like Focus Stacking, HDR and Photo Stitching. (discussed later)
  - Most useful tripods have legs that independently adjust and expand to your full height without a center post.

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- **What is needed to photograph fairly small things close-up?**
  - You need the capability to focus close.
    - ♣ Two Element Close-up Lenses
      - Not to be confused with single element close-up diopters which are not very good.
      - Made by Canon and Nikon, but will fit any lens that has filter accessory threads.
        - ♣ Nikon 3T, 4T, 5T, 6T (if you can still find them)
        - ♣ Canon 250D, 500D
      - No light loss and you can still use auto focus.
      - You do lose the ability to focus on infinity while attached.
    - ♣ Extension Tubes
      - Fits between the camera body and the lens and are basically inexpensive hollow tubes that allow the camera controls for exposure and auto focus to pass through to the lens.
      - Allows the front element to be farther from the film plane for closer focus, and because of this they lose the ability to focus on infinity.
      - No light loss. However the exposure time increases due to the affective size of the aperture decreasing as it moves farther from the film plane.
      - 1:1 magnification can be obtained when the millimeters of extension matches the focal length of the lens. This is usually impractical, but helps explain the mechanics. For example: 25mm of extension, on a 100mm lens, will provide 1:4 or 25X magnification. If the lens has some built in close focus capability, the magnification can increase.
      - Extension tubes can be combined with macro lenses and close-up diopters for increased magnification.
    - ♣ Multipliers (Tele-Converters)
      - Fits between the camera body and the lens and allows the front element to be farther from the film plane for closer focus and also increases magnification by a factor of 1.4X to 2X depending on the multiplier.
      - Can increase either magnification or working distance. For example: If a 100mm lens focused to 1X, provides a working distance of 6 inches, adding a 2X multiplier will render 2X at the same working distance. Or you can move the lens back to 12 inches to get the same 1X magnification.
      - Effective exposure time increases up to 2 times with multipliers
    - ♣ True Macro lenses

- Best and most costly choice for close-up photography.
- Not to be confused with zoom lenses that say they have macro capability. They usually just focus a little closer than regular zoom lenses.
- True macro lenses are usually the finest lenses available due to the high demand of sharpness required.
- They are extremely good out to infinity. They make excellent fixed focal length lenses.
- Can be combined with close-up diopters, extension tubes, and multipliers for extreme close-up up to 3.2:1 or greater.
- Best magnification capability for most macro work is 1X, but .5X works great for larger butterflies and moths.
- 180-200mm is the most desirable focal range due to the increased working distance and decreased angle-of-view (when working with full frame digital cameras).
- 90-100mm is the next best choice. Usually less expensive than the longer macro lenses. (Actually works very well with crop sensor cameras).
- 50mm is recommended for copy work. Working distance is too small and angle-of-view is much too large.

♣ Focus Stacking – discussed later.

♣ Flash

- Fill Flash – Image is exposed as if there were no flash. Flash is set for less output than needed.
- To use your flash in fill flash mode you will have to use negative compensation. Rule of thumb – The closer the subject is, the more negative compensation needs to be used. For macro and close-up work the compensation is often -1 2/3 to -2 2/3. Experiment around, the goal is to brighten up the shadows and maybe adding a highlight to the eyes, but the result should not look as if a flash was used.
- For close-up work the flash often works best if it is not mounted directly on the camera and an off-camera flash cord is used.

o Best Close-up and Macro techniques

♣ Use apertures as a creative tool.

- Select an aperture that is small enough to keep the important elements of your image sharp while being big enough to render unimportant elements out of focus.

♣ Keep the background clean and simple.

- Keep sharp lines and distracting highlights out of the background so you won't have to remove them in post processing.

- ♣ Minimize camera and lens shake for the sharpest results.
  - Use a sturdy tripod and even a remote shutter release and mirror lockup if available.

- **What is needed to photograph wildlife?**
  - Longer lenses!
    - 300mm to 600mm.
    - A 400mm is often a good compromise where animals are used to people.
    - A sturdy tripod!
  - Photographing songbirds is a lot like close-up photography, as the longer lenses do not focus close enough to allow full frame image captures. A lot of the same equipment used for macro is also used for songbird photography (or any subject that is about the same size).
    - An extension tube will allow a long lens to focus closer.
    - A multiplier will increase the size of the subject in the image.
  - 500mm or 600mm lenses with a tele-converter are recommended for wary or even dangerous wildlife. They are also useful for large wading birds that are not very close. Several well-intentioned photographers have been killed by animals because they approached too close with an inadequate focal length lens.
  - Best Wildlife techniques:
    - Research the best places and best times to photograph wildlife and visit then. It may be tempting to time a photo trip around holidays, etc. but pictures of wildlife with shabby coats, dropped antlers, or dull plumage rarely makes pleasing images.
    - All animals are majestic and deserve to be photographed in their prime and in their natural habitat. Roads, fences and signs detract from the image and the sense of wildness.
    - Images of wildlife look best when the animal is not stressed and worried about your presence. Try to use the proper focal length lens so you do not have to approach them too closely, but if you have to - do so in a controlled patient manner and let the animals return to what they were doing before moving forward again. If they don't – you are too close.

- **Raw or JPEG?**
  - Something to consider is that every digital camera is always shooting in raw mode and requires a raw conversion program. But, if we choose to let the camera save the file as a JPG we are committing to using the raw conversion program that is built into the camera.

- If we save the file in raw format we have the opportunity to do the conversion on a more sophisticated platform with more sophisticated software, and to do so again and again, if there's any benefit to this in future. In other words, the decision is — do you want to do the raw file conversion in the camera, or later on your computer under your control?
- With a JPG file you are committing yourself at the time of exposure to several of the most important aspects of image quality, white balance, contrast, color saturation and even sharpening.
- Possibly the biggest advantage of shooting raw is that one has a 16 bit image to work with. This means that the file has 65,536 levels to work with. This is compared to a JPG file's 8 bit space with just 256 levels available.
- Because a raw file has not been processed in any way, if new and improved methods of image processing advances are made, you can return to your archived raw files and work on them again.
- Edits made to raw images are not destructive because the base data is never changed. No matter how many changes are applied, the image quality is not compromised and the image is not compressed so the detail in the image is not lost.
- The major factor loss of quality with JPEGs is the Discrete Cosine Transformation (or DCT) which divides the image into blocks of 8×8 pixels and determines what can be "safely" thrown away because it is less perceivable. And when the image is put back together a row of 24 pixels that had 24 different tones might now only have 4 or 5. That information is forever lost.

- **Disadvantages of shooting RAW:**
  - A RAW image file can be as much as 10 times larger than a JPEG image and can take longer to write to the memory card. This means your response time may be slower and your memory card will fill up faster.
  - You cannot view the image without a RAW image viewer program. Some camera manufacturers supply software with the camera or have free downloads on their websites.
  - It can be time consuming to process the image after you've taken the picture.
  - Sometimes the RAW image looks awful. If you are using Photoshop you can set the camera raw preferences to render the preview with its "best settings" guess. This is usually a default setting.
  - Larger file size means it will be slower to transmit images wirelessly and online.

- **The Histogram is your friend!**
  - The histogram is essential for getting the best exposure. It is the most powerful tool in digital photography. The less you have to manipulate the exposure with software, the better the picture.

- It is best to not increase the exposure with your software. However, you can safely decrease the exposure several stops.
- If your camera has a setting to display highlight clipping – turn it on.
- The general rule is to expose as far to the right of the histogram, without clipping, and use photo editing software to expand the range to the left. This means exposing for the highlights and manipulating the shadows later.
- This is the main reason that shooting in both JPEG and RAW does not work. To get the best RAW image, shooting to the right of the histogram, effectively produces a terrible JPEG.
- Histogram techniques:
  - Take a picture of the brightest part of your scene (for landscapes and birds in flight this is often the sky). If the highlights are not clipping, increase the exposure until they do – then back off 1/3 of a stop and delete the image. Be aware that changing light conditions may cause clipping again, so check often. Next time you are in the field where there are other photographers – notice that some of them are occasionally aiming their cameras toward the sky. This is what they are doing.
  - If you are waiting around for your subject to raise its head or do something interesting, take test shots and check your histogram again. That way you are prepared when the action starts.

- **General Techniques**
  - Composition
    - Be cautious of subject placement and the elements of design.
      - Rule of Thirds
      - Level Horizons
      - Subject Placement for Interest
  - Sharpness - An image that is unintentionally not sharp is a bad image. Sharpness is a function of:
    - Lens Quality – If not using the highest quality lens, then everything else must be perfect to get a sharp image.
    - Digital Processing Capability – All digital images must be software sharpened. Doing so detracts from the overall quality, so strive to only do the minimum amount of sharpening by capturing the image as sharp as you can.
    - Subject Movement – Faster shutter speeds, higher ISO (Image stabilization is useless here.)
    - Camera Movement – Faster shutter speeds, higher ISO, sturdy tripod, image stabilization (tripods and IS are not always compatible. Check your manuals)
    - Depth of Field

- Larger apertures produce shallower depth of fields. Smaller apertures produce deeper depth of fields but often require a tripod or higher ISO. Learn to use apertures to your advantage. Best option is always use a tripod and use the aperture and shutter speed combination that produces the results you want.
- As magnification increases – depth of field decreases and smaller apertures must be used, sometimes meaning faster shutter speeds and higher ISO.

- **Exciting advances in digital photography**
  - HDR – High Dynamic Range
    - Taking multiple images at varying exposures and using software to combine the images into a new image with greater shadow and highlight detail.
    - You can plan for this in the field by taking multiple exposures, or you can take the same raw file and convert it at various exposures.
      - ♣ **Photoshop**
      - ♣ **Photomatix**
      - ♣ **Efex HDR Pro**
  - Imaging Stacking
    - Taking multiple images at different focus points and using software to combine the images into a new image that is sharper throughout.
      - ♣ **Photoshop**
      - ♣ **Helicon Focus**
  - Photo stitching
    - Taking multiple overlapping images and using software to "stitch" the images together into a panoramic image.
      - ♣ **Photoshop**
      - ♣ **Helicon Focus**
  - All of the above!
    - Taking multiple images at varying exposures and focus points that overlap and using software to create a panoramic image that is sharp throughout with greater shadow and highlight detail.

- EXTRA CREDIT
  - How to determine correct exposure (truly a lost art).
    - Meter off the most important subject in the image. This is usually the brightest part of the image. If the brightest part of the image is a significant part of the image, and you fail to capture any detail, the image is useless. Obviously, if you can meter a very small area, you are better off. This is easier to do if your camera has a built in spot meter.
    - Determine how much the subject's tone differs from medium. Don't think of 18% gray, think of medium. Most of us are familiar with medium colors; medium green, blue, red, etc. If the subject is medium, then the exposure indicated by your

camera's meter should be fine. If it is lighter than medium, you will need to add more exposure. If it is darker than medium, subtract exposure.

- Try to become familiar with certain things in nature and their reflectance. Green grass and most green leaves from deciduous trees, and deep blue skies (like out west) are close to medium. Pine trees and spruce trees tend to be darker and require 1/2 to 2/3 stop less exposure. New, light green leaves in the spring, yellow aspen leaves, and other light foliage usually require 1/3 - 2/3 stops more exposure.
- If the brightest part of your picture is brighter than medium, determine how much brighter. Snow with detail is usually only 1 2/3 - 2 stops lighter than medium. If it is not as bright as sunlit snow or a white house, it is probably only +2/3 to +1 stop brighter than average. Determine if it is closer, in reflectance, to bright snow or medium toned grass and compensate in 1/3 stops accordingly. It helps to break the decision down to incremental differences.
- White can be the easiest thing to meter. If you want to preserve detail in bright white you need to add 1 2/3 to 2 stops of additional exposure. Usually +1 2/3 stops will be sufficient for bright snow, and still provide good detail in the snow.
- If the subject is darker than medium, it is easier. Our black Labrador retriever requires minus 1 stop to show detail in his black coat, just like a black bear would. I almost never compensate for dark subjects more than 1 2/3 stops, and usually only 1 stop. Determine if the subject's tone is as dark as a black bear, and compensate -1 to -1 2/3 stop.
- Our yellow Labrador retriever needs +2/3 stop exposure to reproduce her light yellow fur. To get a properly exposed image of both of them together, we set them up in open shade and meter off the yellow lab, increase exposure by +2/3, and use a fill flash to bring out the detail in the black lab. In other words, we are setting the exposure to sacrifice detail in the black fur, and using fill flash to bring it back out.