PHOTOGRAPHY AND DIGITAL IMAGING

In this session, the presenter Tim Cordell began the session by explaining that there are two basic components in digital images, the number of pixels and print size. Mr. Cordell explained and defined eighteen terms used in photography as well as how these terms relate to the parks setting. The terms he defined ranged from determining what a pixels and megapixels are to pixels per inch, compressing pictures and vector formats. The next topic of discussion focused on file formats. Files such as JPEG, TIFF, BMP and several other common types were discussed. Mr. Cordell discussed several other topics to include how to incorporate pictures into power point presentations, scanning pictures, printing pictures, uploading pictures on to your website and how to store pictures. The presenter also gave information on various ways that photos can be taken to be better in general and better for advertisements and other projects in the parks setting. Mr. Cordell gave additional tips on what to look for when purchasing a digital camera for your own personal use and for use at your park. The presenter ended by showing various photos he had taken and how using some of the tips and techniques he talked about made a difference in the quality of the photo.
Tips, Tricks & Techniques: 
Photography & Digital Imaging

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Potato Creek State Park
Indiana Department of Natural Resources
DEFINITIONS OF TERMS
Digital Images

• Two basic components:
  1. Number of Pixels
  2. Print Size

• These components can be manipulated to achieve different affects.
Pixel

• A pixel or "picture element" is a specific x,y coordinate within the image.
Megapixel

• The image is created out of millions of pixels: hence, megapixels.

• A 6 megapixel camera would record an image 3,000 pixels by 2,000 pixels totaling 6 million pixels (6 megapixels)
**Bit Depth**

- The bit-depth of a pixel refers to the number of possible combinations of ones and zeroes.
- Bit-depth in turn determines how many different colors the pixel could have.
DPI

- DPI or "dots per inch" describes the resolution of a printer.
- A 2400 x 1200 printer can place about 3 million dots in a 1 inch x 1 inch square on the paper.
PPI

• PPI or "pixels per inch" is the resolution of an image file when that image file is displayed/printed at a certain size.

• A 3000 x 2000 pixel image will be 300 PPI only if displayed/printed at a size of 10 x 6.67 inches.
DPI /PPI

- DPI = Dots Per Inch
- DPI is what your printer spews out – dots on paper. DPI is printer output.

- PPI = Pixels Per Inch
- PPI is what digital cameras and scanned images produce. PPI is input.
SPI

• SPI (samples per inch) is scanner and digital image resolution.
• Scanners take a sampling of portions of the image.
  – The more samples it takes per inch, the closer the scan is to the original image.
• Higher the SPI, the higher the resolution
Compression

• Compression is a mathematical process that reduces the file size of images by discarding inessential data.
Lossless vs. Lossy Compression

• Lossless compressions discard no information
  – Use more efficient ways to represent an image
  – They may look for a recurring pattern in the file, and replace each occurrence with a short abbreviation, thereby cutting the file size.

• Lossy algorithms accept some data loss
  – A lossy algorithm might store color information at a lower resolution than the image itself.
Resampling

• Resampling is a process which deletes or creates pixels from an image to achieve a desired effect.

• This can be done by scanners and programs that allow you to edit images, like Adobe Photoshop.
Interpolation

- Interpolation is a way of extrapolating data between pixels to create more pixels than were recorded in the original.
- This does not add any real data to the image, it just predicts what the image might look like if there were more data.
Vector Formats

- In a vector format, the picture is represented by a mathematical description.
- This is used in clip art or illustrations.
- For example, a vector format file of the moon might describe it as a circle with black line and white fill.
Vector Formats

- Very efficient from a file size perspective
- Scale well:
  - as they are made larger, they retain smooth lines
  - and as they are made smaller they retain the detail of the image
Raster Formats

• In a raster or "bitmap" format, the picture is represented by dots (pixels) arranged in rows and columns

• Very effective for detailed images, such as photographs
Raster Formats

• Files tend to be larger
• Do not scale well:
  – when they are made larger, they tend to 'pixelate' and smooth edges become rough
  – when they are made smaller, details are lost
Antialiasing

- Raster graphics are often antialiased to soften the edges of high-contrast art that look jagged on a monitor.
  - makes a high-contrast graphic look good on a monitor
  - the soft edges look bad when printed on paper
Dithering

• Dithering is the attempt to approximate a color from a mixture of other colors when the required color is not available.
File Formats
Camera’s File Format
RAW

• RAW images are unprocessed images.
• Raw files are like exposed but undeveloped film.
• Most are proprietary and only work with the specific software that created them.
JPEG

- JPEG = “Joint Photographic Experts Group”, the organization that developed the format

- The files often end in the three-letter extension JPG (or JP2 for JPEG 2000)
JPEG Compression is “Lossy”

• Simply opening a JPEG file does not harm the image in any way.
• Saving a JPEG repeatedly during the same editing session (without ever closing the image) will not decrease quality.
• If a JPEG image is opened, edited, and saved again it results in additional image degradation
JPEG Pros & Cons

• Well suited for large photographic images where file size is the most important consideration
• Not suitable for most small images under a few hundred pixels in dimension
• Not suitable for screen shots, images with text, images with sharp lines and large blocks of color
• Not good for images that will be edited repeatedly.
EXIF (Exchangeable Image File)

- Digital cameras use these to store extended camera information about the picture taking conditions such as the date the picture was taken, the shutter speed, aperture, and others in the header of each JPEG file
Image Details Stored in Exif Files
TIFF

- TIFF = “Tagged Image File Format”
- Ideal for high resolution printing
- Lossless, good for archiving images
- Large file sizes
- Most web browsers do not support tiff
GIF

• (Graphics Interchange Format)
• Lossless compression
• Widely used for Web graphics
• GIF uses 8-bit color (256 colors), but picks them from millions of choices.
• Not suitable for large images
BMP

- **(BitMaP)** is an uncompressed proprietary format invented by Microsoft for Windows.
- BMP stores color data for each pixel without any compression.
- Crisp, high-quality graphics, but also very large file sizes.
- Not very useful.
PNG

- PNG is a lossless storage format.
- It looks for patterns in the image to compress file size.
- Good for photographs without loss on the web.
- PNG is the only lossless format that web browsers support.
- PNG is superior to GIF. It produces smaller files and allows more colors.
PSD & PSP File Types

• PSD are proprietary Photoshop files
• PSP are proprietary Paint Shop Pro files
• Use for editing images in their software
  – only the proprietary formats retain all the editing power of the specific programs.
• Save your final as a TIFF or JPG, or you may not be able to view it in a few years when your software has changed.
Files for Web Use

• Currently, GIF and JPG are the formats used for nearly all web images.
• PNG does everything GIF does, and better
• PNG may replace GIF in the future.
Digital Photography
How To Choose A Digital Camera

1. Resolution
2. Lens aperture, lens zoom range
3. Lens quality
4. Software
5. Media type
6. CCD sensitivity also varies somewhat
Determining Digital Resolution

• Divide the number of pixels captured (along one axis) by the print size chosen (again along one axis).

• For example, an image with 1800 pixels & printed at 6 inches along its width would have a resolution of 300 ppi (1800 pixels / 6 inches = 300 ppi).
Resolution

- Resolution is the number of pixels in the captured image.
- 1.3 Megapixel = 1280x960: Great 4x6's, OK 5x7's.
- 2 Megapixel = 1600x1200: Pretty good 8x10's.
- 3 Megapixel = 2048x1536: Great 8x10's, good 11x14's.
- 4 Megapixel = 2272 x 1704: Great 11x14's, and acceptable 16x20's.
- 5 Megapixel = 2560x1920: Pretty good 16x20's.
- 6 - 10 Megapixels = At this point you are usually limited by the lens, not the pixels.
Some Cameras Resolution Adjusts
Differences in Camera MP

- 4MP
- 6MP
- 10MP Cameras
Cropped & Pasted

4MP

6MP

10MP

• **Note:** Fewer pixels = smaller screen image
Shown At Same Size

- 4 MP
- 6MP
- 10MP (all 3 have been compressed)
Lens Aperture

- The aperture of a lens is its maximum opening.
- Lens aperture is measured in f/numbers.
- Smaller numbers mean bigger lens openings. A lens that is f/2.0 is better than a lens that is f/4.0.
- Zoom lenses often have a range of maximum apertures listed, such as f/2.5 - f/4.0.
  - The maximum aperture at the most wide angle setting is f/2.5
  - The maximum aperture at the most telephoto setting is f/4.0.
Zoom Lens

• A zoom lens has a variable focal length.
  – A short focal length is wide-angle.
  – A long focal length is a telephoto.
  – A zoom lens lets you combine both of these and everything in between into one lens.

• Most compact digital cameras have a 3X zoom, with a focal length range from around 35 mm to 105 mm.
Digital Zoom

• Ignore "digital zoom", only pay attention to optical zoom.
• Digital zoom is of no value. All it does is crop the image in the camera.
Lens Quality

• Lenses with the same focal length and aperture can differ substantially in quality.
• Some cameras/lenses have image stabilization that compensate for camera shake at long focal lengths.
• Best approaches to getting a good lens
  – read reviews
  – stick with reputable camera companies, such as Olympus, Nikon, and Canon
Media Type

• CompactFlash; Secure Digital (sD); xD
  – The difference is not worth worrying about unless you already have a lot of one type.

• Avoid proprietary media (such as Sony) to avoid problems using other hardware.
In-Camera Software

- Digital photos require some computation.
  1. Focus
  2. "pre-photo" to determine the brightness and color balance of the scene.
  3. Then the real picture, based on that information.
My Photo’s Always Taken Too Late

• The “pre-photo” calculations take a fraction of a second, sometimes long enough to miss your shot. Try these…

• 1) Push the shutter button down half way. Keep it there until you are ready for the photo, and then press the rest of the way.
  – Pressing half way signals the camera to immediately choose focus, color balance, and exposure. The subsequent delay when you take your shot is now quite small, comparable to film cameras.

• 2) Switch to manual exposure and focus. Most digital cameras have tremendous depth-of-field, so focus is not critical.
Use Camera Presets

• Most cameras have presets for macro and distant scenes
• Exposure control adjustments are very helpful
• Become familiar with your camera
Exposure Control  +/-
Normal (Exposure) +1
PowerPoint Tips
Preparing Graphics For Powerpoint
Using A Photo Editor

Things you need to think about:

1. File type
   1. JPG for photos
   2. GIF for low-color, high-resolution art

2. Resolution (PPI, DPI or ‘compression’)

3. Image size
1) File type

- It is **ALWAYS** best to save a copy of the image, and to edit the copy, so that the original is preserved.

- Consider including information about the desired dpi and size of the image in the file name: (Heron 350x200 96dpi)
Photoshop: Change File Types
Photo Editors Can Change File Type
2) Resolution

• A computer screen is 72-120 PPI, and usually 96 PPI.
  – It doesn't matter if it's a small screen or a gigantic display.
  – Your computer's display is not going to benefit from image PPI greater than 96 or 120.

• If you plan to print full page, high quality handouts, 200 dpi is a good rule of thumb.
2) Resolution (cont)

- A high-DPI is only needed when printing or if you are going to enlarge the image.
- Image DPI is a problem for PowerPoint.
- Photographs stored with a DPI level that will support printing bloat the presentation with a larger file size for the image than is required for presentations.
PPT: Compress Picture Feature
Large File Uncompressed 2.15mb
PPT Compress for Web 175 kb
Photo Programs Can Change Compression Levels
Photo Programs Can Change Resolution
Photoshop: Auto Resolution
Photoshop: Custom Resolution
3) Image Size

- PowerPoint slides are sized, by default, at 7.5 inches high and 10 inches wide.
- If your image is larger, you have more detail than is useful for your presentation.
3) Image Size (cont)

- Shrink the image size prior to inserting it in your presentation to reduce file size.
- When you 'size' an image in PowerPoint, you are not changing the way the image is saved, you are just 'zooming in' or 'zooming out.'
3) Image Size (cont)

- To determine what size your image should be, draw a rectangle on the slide as a 'placeholder' representing the desired size of the image.
- Right-click the rectangle and choose (Format AutoShape) and look at the Size tab.
- Use that information to size the image prior to inserting it onto the slide.
PPT Placeholder Size
Photo Editors Can Resize

- Resizing images to reduce file size to a manageable size of less than 300 KB. This ensures that people can receive your email.
- Decrease the file size of the exported photos by reducing the dimensions. ZoomBrowser EZ maintains the photo's aspect ratio during resizing.
- You may also reduce the quality of the photo. The image may not look as sharp, but the file size will be smaller.
Photoshop: Image Size
Photoshop: Image Size
Scanning
Scanning

- SPI (samples per inch) is a measurement of image resolution.
- Scanners take a sampling of portions of the image measuring the values at a specific place.
- Scanning resolution is a product of a specific image size at a chosen resolution.
Selecting Resolution

• The best resolution for a scanned image depends on your final output device.
• For most images, scan at approximately one third of your output resolution.
  – For example, use a scanning resolution of 200 dpi if you want to print at 600 dpi.
• If you're scanning an image to view on-screen, choose a resolution of 96 ppi.
Scan Output Resolution

- Select resolution based on planned final use
Scan At Correct SPI For Job
75 spi vs 200 spi
Look at These Prints and Their File Sizes
Enlarging Scanned Images

• Scan images that need to be enlarged greatly at a very high resolution to minimize the later decrease in resolution.

• When resizing is done, the print size and resolution should change inversely to each other, keeping the file size the same.
Example of Inverse Proportion

• 24 MB file size (6000x4000)
• 600 DPI; print size of 10 x 6.67 inches
  – Divide DPI by 3
  – Triple print size
• 200 DPI; print size of 30 x 20.01 inches
Scan Output Size

- Set size in inches
- Set size in pixels
Sharpening

- Any scanner will soften an image somewhat.
- Sharpening an image will give it more distinct edges and a crisper appearance.
- Photographic images, especially slightly faded, older images may be the most notably softened.
- Sharpening **WILL NOT** focus an unfocused image.
- Sharpening is only done to more accurately capture the image in hand; NOT to restore the original image.
Scan Sharpening

Selection Area Dimensions
W: 7.64  H: 8.04
Output Dimensions
W: 7.64  H: 8.04
Scale: 100%
Units: inches

Sharpen
Medium
None
Low
High
Extreme

By JACK COLWELL
Tribune Political Writer

The Indiana Department of Natural Resources director today hailed the freeing of $700,000 for construction of a Potato Creek State Recreation Area lake dam as “a big step” which will assure some public use of the facility in 1976.

Joseph D. Cloud, the department director, also said he will seek an additional $2 million appropriation in the 1975 Indiana General Assembly session to help pay for a downhill ski area at Potato Creek.

While court battles over rezoning and horse-racing rights at Potato Creek...
Scanning Bit-Depth

- Scan with the color profile and bit-depth you will need for final use.
- There may be differences in how colors are expressed if color modes are changed after scanning.
Black & White

• Black and White (1 bit) profiles assign every pixel in the image either a purely black or purely white value.

• This mode is not suitable for use with any kind of photographic image.

• May be used with line art or clearly printed text when a very low file size is desired.
Grayscale

• Grayscale color profiles assign each pixel a shade of neutral gray completely devoid of any color using either 8 or 16 bits
• This profile is useful for black and white photographs or illustrations as well as text
• CAUTION: Many images that appear grayscale may actually be a monochromatic image in another value, for example various shades of sepia or faded bluish-grays rather than a true black to white scale of grays.
Halftone

• Halftone is a process of translating images into a series of dots, lines, or other shapes of one color, usually black on a white background.

• This type of image is commonly used in newsprint and magazines.
Indexed Color

• Indexed color is a limited palette color profile of 256 colors.
• It should be used only with simple graphics and thumbnails
RGB Color

• RGB stands for Red, Blue, Green, the primary colors of light, and hence the primary colors a monitor can display.

• Every color seen on a screen is a combination of these three hues.
CMYK Color

- The acronym stands for Cyan, Magenta, Yellow, and black, which are the primary colors of ink used in offset printing.
- CMYK is the industry standard color profile for professional printing.
- When scanning an image for professional printing it is best to scan it in CMYK.
- If CMYK is not available, scan the image in RGB mode and convert to CMYK in Photoshop.
Printing
SPI and Printing

• When printing photographic images you need to know the final output in order to insure that your digital images have sufficient resolution (SPI) for printing or for screen display.
Look At These Enlargements

Notice the difference resolution makes…
DPI - Printer Resolution

- Most printers print the same number of dots horizontally and vertically.
  - Example: 600 dpi printers print 600 dots across and 600 dots vertically per inch.

- The lower the DPI of a printer, the less fine detail it can print and the fewer shades of gray it can simulate.

- Because monitor resolution is so much lower than printers, low resolution images that look fine on-screen often print poorly.
Printers Requesting 300 dpi

• Saying you want 300 dpi images is like saying you want eight feet of lumber. What dimensions???
  – A two-by-four?
  – A two-by-six?
  – A sheet of plywood?

• Any digital image – ANY – is capable of being reproduced at 300 ppi.
Where Did 300dpi Come From?

- Off-set printing - the type of printing magazines use – resolution is determined by the number of Lines Per Inch (LPI).
- DPI for offset printing should be 1.5 to 2 times the print press’s LPI.
- Glossy magazines usually print at 175 LPI – (175 x 1.5 = 263) (175 x 2 = 350)
- Split the difference ~ 300 dpi
Photo Editing Workflows

• Don’t worry about size or resolution until print time.
  – You can't change the number of captured pixels in the image anyway
  – Resolution is determined (automatically) by size at print time.

• Scanners are the exception to this since they scan an object with a known size at a chosen resolution.
For Websites

• Most monitors display at 72 or 96 ppi
• Information in images beyond 96 ppi
  – is wasted
  – won't enhance the display
  – unnecessarily increases the file size and download time.
Files For Web Use

- Currently, GIF and JPG are used for nearly all web images.
- PNG is supported by newer browsers. PNG may replace GIF in the future.
- TIFF is not widely supported by web browsers, and should be avoided for web use.
Effect of DPI Setting on Image Size

- Many image formats include a dpi setting as part of the file.
- This setting is used by most programs in determining the scale at which to print the image.
- This setting has no effect on screen image size in nearly all web browsers.
Here are two pictures. Both are 350x262 pixels, but the ppi settings are different:

300 ppi
They would appear the same size in a web browser. Most browsers display each image pixel as one screen pixel and pay no attention to the pixels per inch value. However, printers may render the one more than four times larger than the other.

72 ppi
Photoshop: Save For Web
Dreamweaver Image Size

February 19, 2011

Bluebirds—Come to the regular monthly meeting to see a colorful program about the eastern bluebird. This interesting program will be presented by Ken Murray. Ken Murray is a lifetime resident of Friends of the Creek and a member of the Indiana Bluebird Society, currently serving as treasurer, and the North American Bluebird Society. He is a naturalist who enjoys sharing his twenty-five years of experiences on his bluebird trail. His program will include a video which will cover the history of the bluebird, how to attract them and the problems they face today. There will be a question/answer session and informational handouts will be provided.
E-mail Image Attachments

• How will recipient use image?
  • On screen – low resolution, small
  • Print – Generally at least 200 ppi
  • Other - resolution to match need
Storage
Storage

• **ALWAYS** make copies of your images, leaving the originals intact, before you edit, alter or crop them.
Archiving

• JPEG should only be used for archiving when disk space is the primary consideration.
• Because JPEG images lose quality each time they are opened, edited and saved, it should be avoided for storage where the images require further processing.
• Always keep a lossless master copy (e.g. TIFF) of any image you expect to edit again in the future.
Storage Methods

- Memory cards
- Hard drive
  - Loose everything if crashes or becomes infected with a virus
  - Back up all images by any secondary method
- CD’s
  - pay attention to organization
- DVD
  - rewritable DVD, can keep adding your image files
- Online storage
  - sometimes limits to image file size
- Printing images
  - scanned photo print will have far less quality than the original
  - prints are prone to potential damage from water, heat, light, etc.
Sources