Digital Photography in the Backcountry

- What is Digital Photography?
- How Do Digital Cameras Work?
- About Image Quality (Megapixels, Compression, etc)
- Fundamentals of the Digital Image
- Digital Pros & Cons
- Backpacking With a Digital Camera

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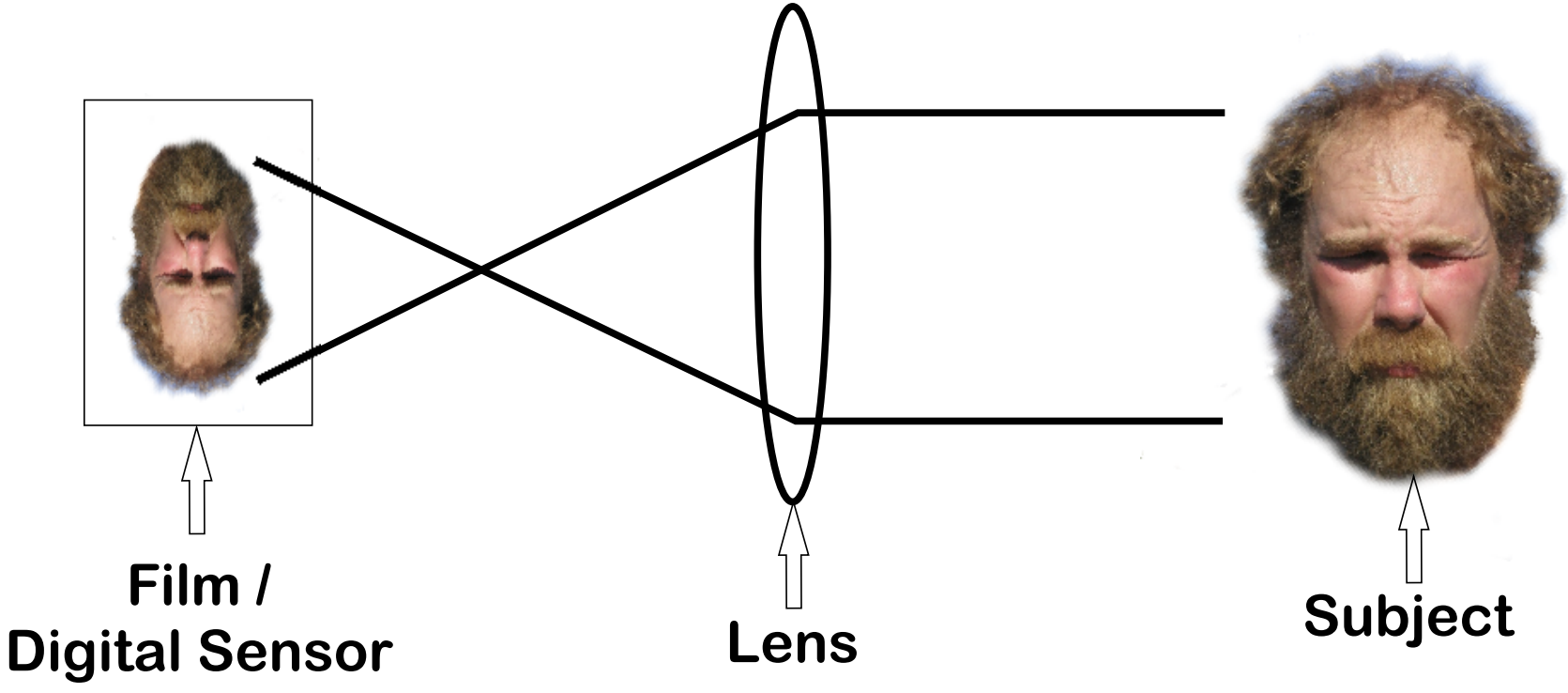
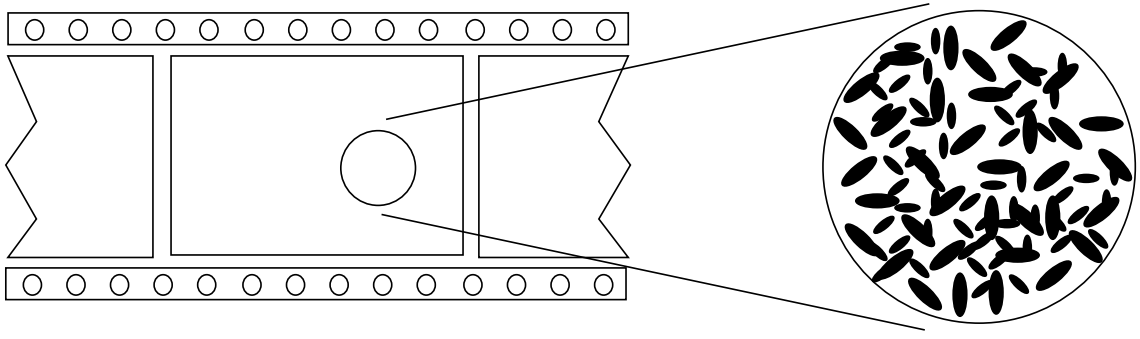
Digital vs. Film...

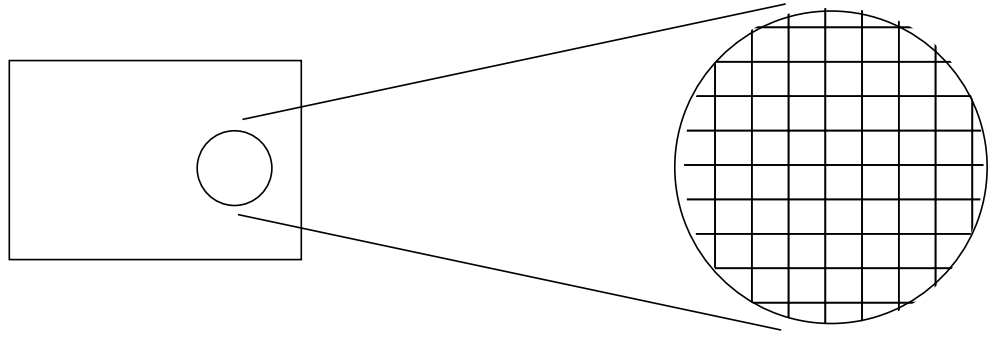


Digital vs. Film...



Film...

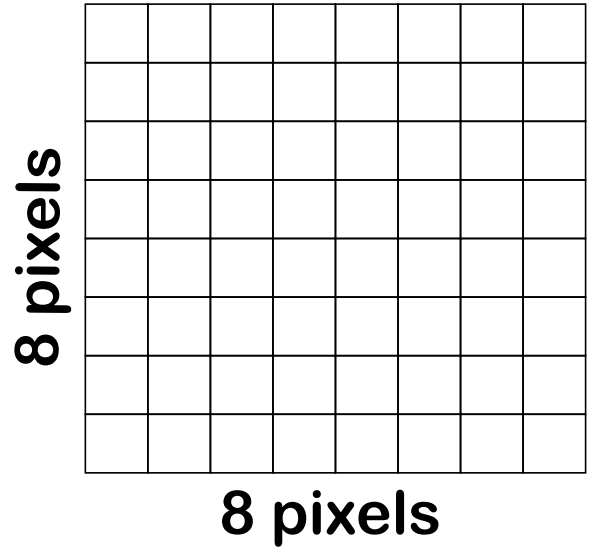
...is made of grains



Digital Sensor...

...is made of a grid.

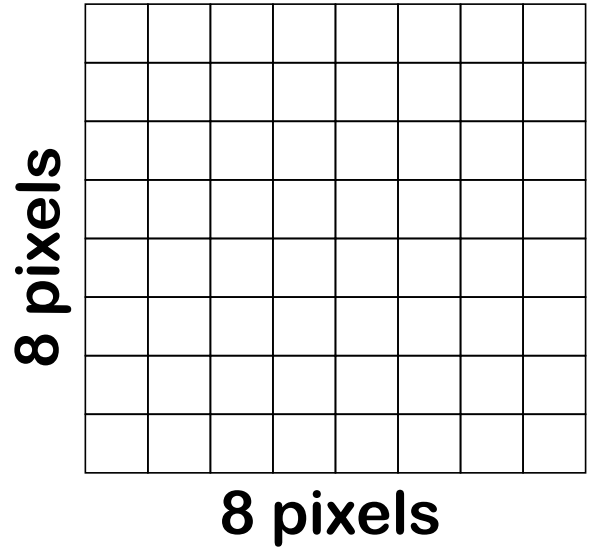
How does it work?



8 pixels x 8 pixels = 64 pixels

Each square in the grid can sense one point of light, or “pixel”

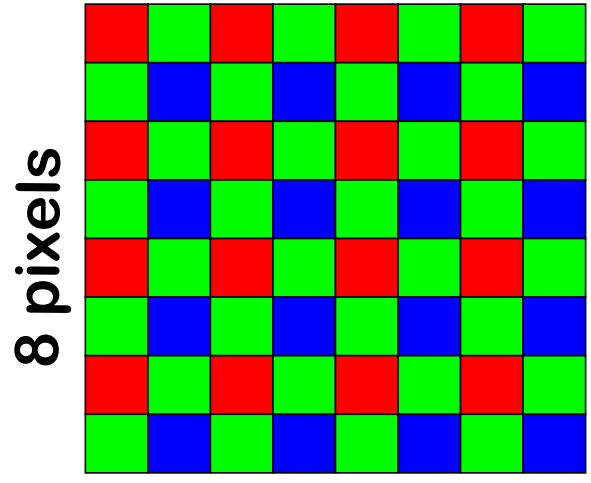
How does it work?



8 pixels x 8 pixels = 64 pixels

Each square in the grid can sense one color

How does it work?

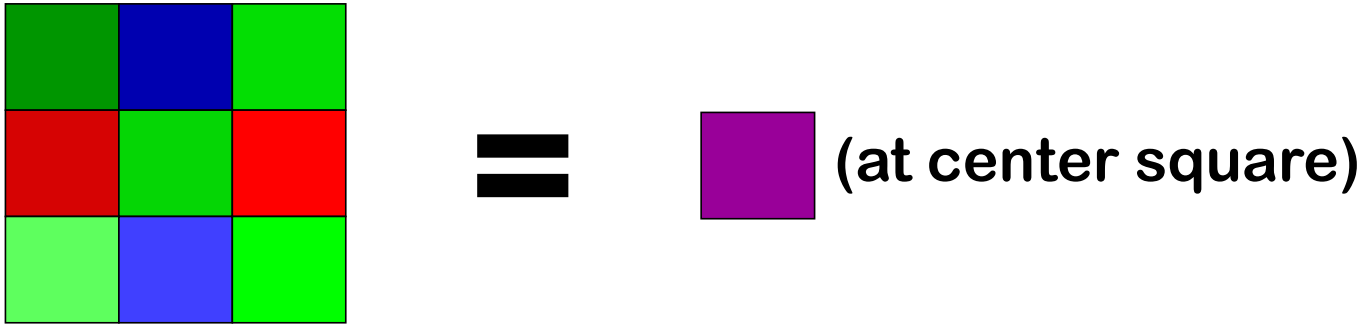


8 pixels x 8 pixels = 64 pixels

Each square contains a color filter.

The colors are arranged in a special pattern…
(bayer filter pattern)

How does it work?



The camera mixes the colors from neighboring pixels to determine the “actual color” for each pixel.

More pixels give a clearer image

20 x 30 = 600 pixels

More pixels give a clearer image

100 x 67 = 6,700 pixels

More pixels give a clearer image

200 x 300 = 60,000 pixels

More pixels give a clearer image

400 x 600 = 240,000 pixels

How clear is clear? (a rough guide!)

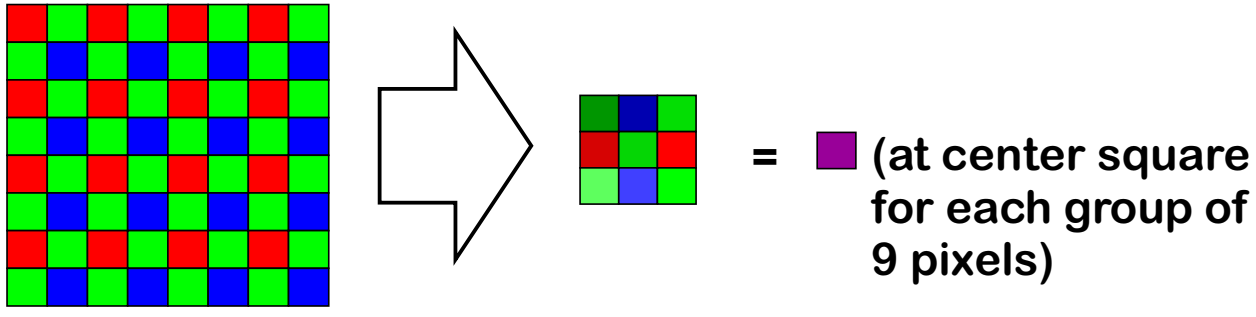
Vertical	Horizontal	Pixels	
480	640	307,200	⇐ **OK for e-mail**
768	1024	786,432	⇐ **This projector!**
1200	1600	1.9M	
1500	1950	2.9M	
1600	2100	3.4M	⇐ **Point & shoot**
1704	2272	3.9M	
2000	2600	5.2M	⇐ **Good 35mm print**
2048	3072	6.3M	
2400	3600	8.6M	⇐ **Good 35mm slide**
2800	4200	11.8M	
3200	4800	15.3M	
4000	6000	24M	
5000	7500	37.5M	⇐ **Medium format 6x7**

- **"Equivalent Clarity" is very subjective & a matter of MUCH debate!!!**

“Ideal Resolution” vs. “True Resolution”

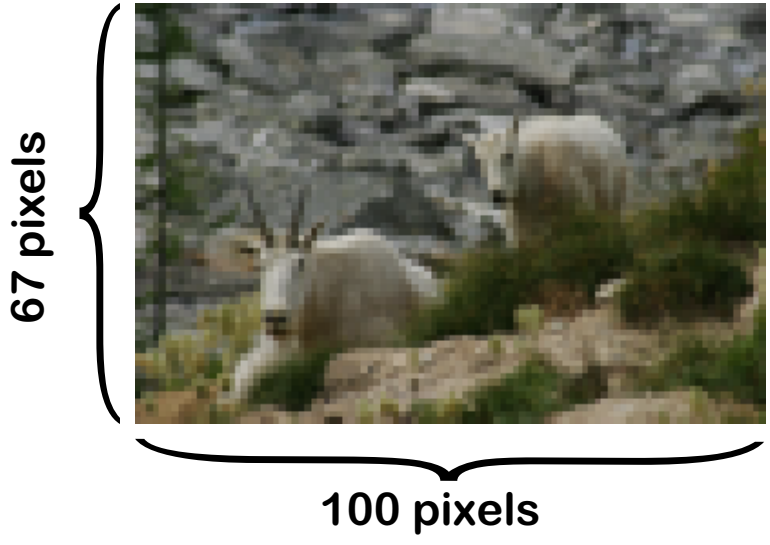
Other factors can help determine your “true resolution”

- **Quality of the lens**
- **Quality of the sensor** (“Noise”, etc.)
- **Quality of the photographer**
- **Shutter speed & camera “shake”**
- **Remember this…?**



Intro to Digital Images

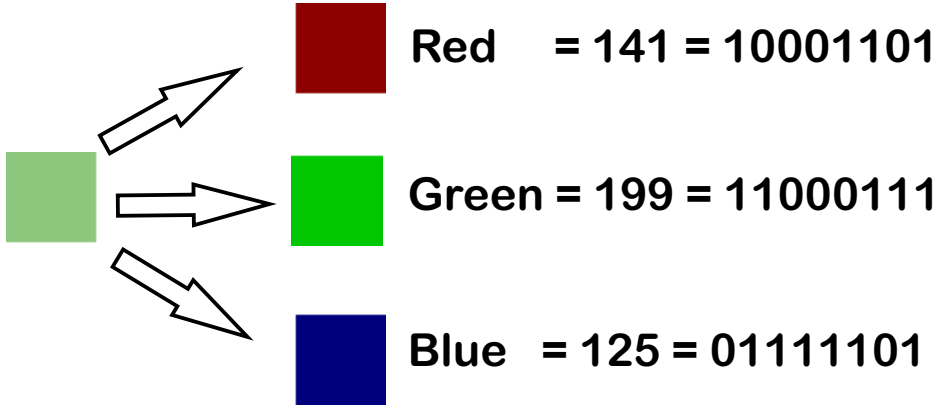
- Digital images are made of pixels:



- The color of each pixel is represented by a code of “bits”, or 1’s & 0’s

Intro to Digital Images

- A color is separated into its “components”
- Any color can be made from a combo of Red + Green + Blue
- 255 possible shades for each primary color (24-bit color)



100011011100011101111101 = 24-bit color

24 “bits” for each pixel

All about DPI

- A pixel = A “Dot”
- **DPI = Dots Per Inch**
- DPI defines how “big” you want each pixel to be printed

300 “dots” @ 100 dpi = 3 inches horizontal
200 “dots” @ 100 dpi = 2 inches vertical

or

300 “dots” @ 50 dpi = 6 inches horizontal
200 “dots” @ 50 dpi = 4 inches vertical

or

300 “dots” @ 300 dpi = 1 inch horizontal
200 “dots” @ 300 dpi = 0.66 inches vertical

All about DPI

- DPI is an arbitrary measurement
- The DPI of an image is totally defined by YOU!
- Higher DPI = Smaller, crisper printed image
- Lower DPI = Larger, fuzzier printed image

- With more pixels, you can print a larger, crisper image

How much DPI is enough?

- 72 dpi = most computer monitors
- 150 dpi = newsprint
- 300 dpi = fine photos / magazines, etc.

- The human eye can not easily perceive more than 300 dots per inch...

DPI, a rough guide...

Vertical		Horizontal		Pixels	100 dpi	200 dpi	300 dpi
480	x	640	=	307,200	4.8 x 6.4	2.4 x 3.2	1.6 x 2.1
768	x	1024	=	786,432	7.7 x 10.2	3.8 x 5.1	2.6 x 3.4
1200	x	1600	=	1.9M	12.0 x 16.0	6.0 x 8.0	4.0 x 5.3
1500	x	1950	=	2.9M	15.0 x 19.5	7.5 x 9.8	5.0 x 6.5
1600	x	2100	=	3.4M	16.0 x 21.0	8.0 x 10.5	5.3 x 7.0
1704	x	2272	=	3.9M	17.0 x 22.7	8.5 x 11.4	5.7 x 7.6
2000	x	2600	=	5.2M	20.0 x 26.0	10.0 x 13.0	6.7 x 8.7
2048	x	3072	=	6.3M	20.5 x 30.7	10.2 x 15.4	6.8 x 10.2
2400	x	3600	=	8.6M	24.0 x 36.0	12.0 x 18.0	8.0 x 12.0
2800	x	4200	=	11.8M	28.0 x 42.0	14.0 x 21.0	9.3 x 14.0
3200	x	4800	=	15.3M	32.0 x 48.0	16.0 x 24.0	10.7 x 16.0
4000	x	6000	=	24M	40.0 x 60.0	20.0 x 30.0	13.3 x 20.0
5000	x	7500	=	37.5M	50.0 x 75.0	25.0 x 37.5	16.7 x 25.0

Size of camera's sensor (pixels)

Size of printed image (inches)

Storage…

- Photos are stored as digital files on infinitely re-usable memory cards.

- Memory cards can be removed, re-inserted into the camera.

- Memory comes in many types / sizes

- Connect your camera (or a memory card reader) to your computer with a cable (USB, etc.)

- You can then print the image, e-mail it, put it on the www…

Data compression…

- Image files are usually “compressed” (.jpg is most common)
- More compression = smaller file size
- More compression = lower “quality”

Uncompressed 6.3 Megapixel Image = 13.8 Mb

Low Compression = 0.85 Mb

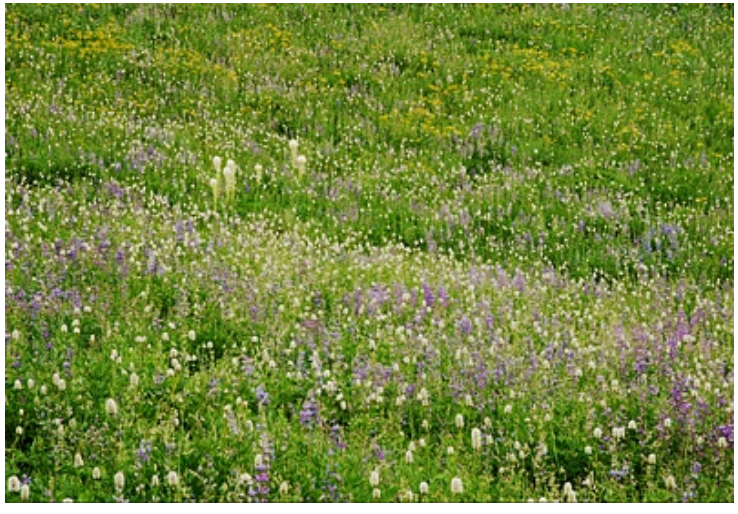
High Compression = 0.16 Mb

Data compression…

- Compressed file sizes also depend on the “complexity” of the image

Low Compression, 6.3 Megapixel Image…

Simple image = 0.85 Mb



Complex image = 3 Mb

How much memory is enough?

- How many photos can you fit on a memory card?...
- Low compression... Average complexity...
- Actual results may vary!

Memory card size

Camera pixels	32Mb	64Mb	128Mb	256Mb	512Mb
1.9M	42	85	170	340	679
2.9M	28	56	111	222	445
3.4M	24	47	95	190	379
3.9M	21	41	83	165	331
5.2M	16	31	62	124	248
6.3M	13	26	51	102	205
8.6M	9	19	37	75	150

...Number of photos

Going Digital… Pros & Cons.

+ Experimentation (no added cost for many more photos)
+ Immediate Feedback (photos displayed on Camera's LCD panel)
+ Long-Term Storage (no degradation)
+ The "Digital Darkroom" (big plus!)

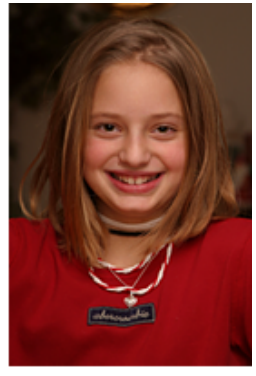
+/- Traveling Flexibility (improving every year)
+/- Cost (cheaper "per shot", but computer, memory, batteries, camera, printer, etc. add up!)

- Batteries (only a problem on a long hike)
- Slide shows… (expensive digital projector)
- Color resolution & funky aberrations…

Other Digital Considerations

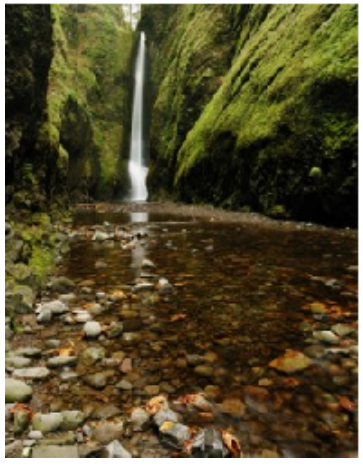
- **Adjustable White Balance Settings.** (for shadows, clouds, indoor)

Indoor Lighting

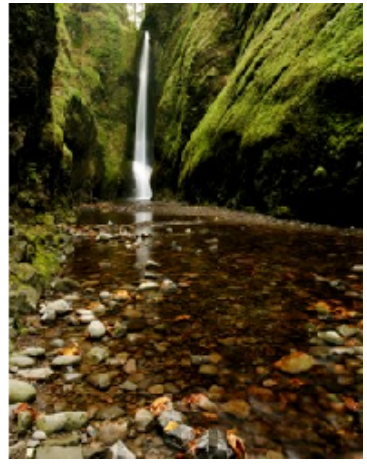


Corrected

- **Greater Contrast Range With Some Digital Cameras**



Digital



Film

Other Digital Considerations

- Digital Color gradients

- High-contrast “bleeding”

- On-the-fly ISO adjustments

Other Digital Considerations

- Aspect ratio on <u>many</u> digital cameras is different than 35mm

35mm Film 4 x 6

Digital 3 x 4

- "Grain" looks different than film

- Learning curve getting easier all the time...
  ...but new features are being added too!

- Whatever you buy will be old technology tomorrow!

Digital Backpacking Considerations

- Weight, batteries, memory
- How many photos do you plan to take?
- What will you do with your photos when you're done?
  - Web site
  - Slide show
  - Photo album/scrapbook
  - e-mail / regular mail to family & friends

Digital Backpacking Tips

- Minimize use of LCD panel to save batteries
- Beware of bad weather!
- Change quality/size settings for the quality of the shot:
  - Funny trail sign = Low quality/size
  - Hiking buddies = Medium quality/size
  - Flowers in Paradise Park = High quality/size
- Erase / Edit “bad” photos only if you have more batteries than memory.

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