LiDAR and Its Application to Rangeland Management

August 11, 2003
Rangeland Remote Sensing Workshop
Idaho State University

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What is LiDAR?

- **Light Detection And Ranging**
- Scanning instrument mounted on airplane or satellite
- GPS used to determine instrument position and orientation
How Does LiDAR Work?

Determines distance using a pulse of (laser) light

distance = speed of sound × time

d ≈ 300 meters → t ≈ 1 microsecond

Δd ≈ 30 cm → Δt ≈ 1 nanosecond
Why Use LiDAR?
Advantages of LiDAR

• High data density
• Easily cover large areas
• Can map remote and inaccessible areas
• Ground survey teams needed only for validation
Some LiDAR Uses

- Elevation Maps
- Hydrology
- Vegetation Canopy
- Urban Studies
- Shoreline Monitoring
- Planetary Mapping
Hydrology
Vegetation Canopy
Shoreline Monitoring
Planetary Mapping
Data Processing

- Validation through the use of Ground Control Points (GCPs)
- Interpolate irregularly-spaced data to uniform grid
Data Characteristics

- Intensity
- Multiple pulses
Drawbacks

• Need good weather
  – High visibility
  – Data quality depends on platform stability
• Difficult to detect surface through dense vegetation
• Large data files
  – One meter spacing means one million points per square kilometer
Products

- Raw data
- DEM
- Contour maps
- Breaklines
- Extracted Features
- Intensity
Providers and Cost

Airborne1 (Los Angeles, California)
www.airborne1.com
Horizons (Rapid City, South Dakota)
www.horizonsinc.com
Terrapoint (Houston, Texas)
www.terrapoint.com

Cost: few dollars per acre
(over a thousand dollars per square mile)
Idaho Rangeland Examples

• Sheep Station
  – Burn, vegetation monitoring
• Salmon Falls
  – Hydrology
• INEEL Dunes
  – Aeolian transport
Salmon Falls
INEEL Dunes
Questions?

…where the deer and the antelope play.