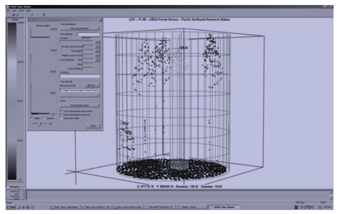
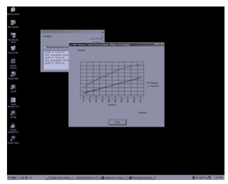
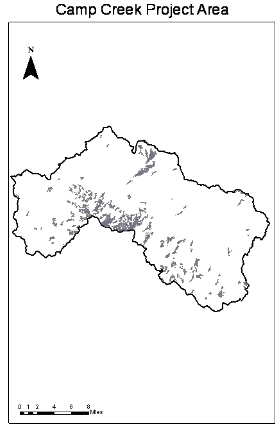
Distribution of trees in the Camp Creek Project Area





Camp Creek Project Area



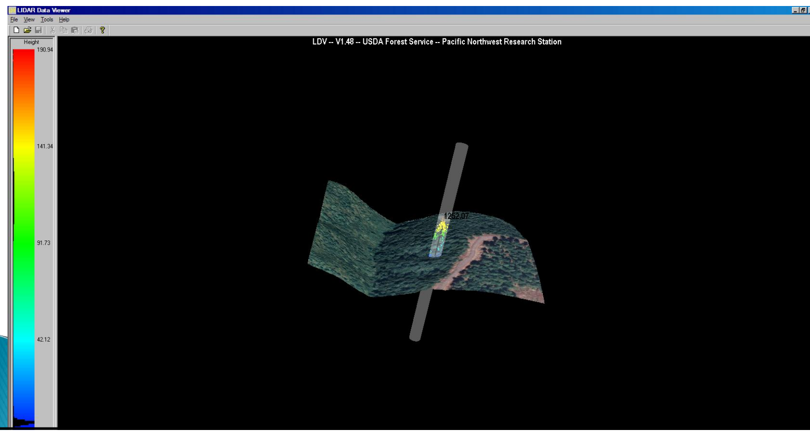
Presented by Joey Roberts and James Bradd

Outline

- Goal of project
- Importance of work
- Software and processes
- Methods
- Results and discussion
- Strengths and limitations
- Conclusions

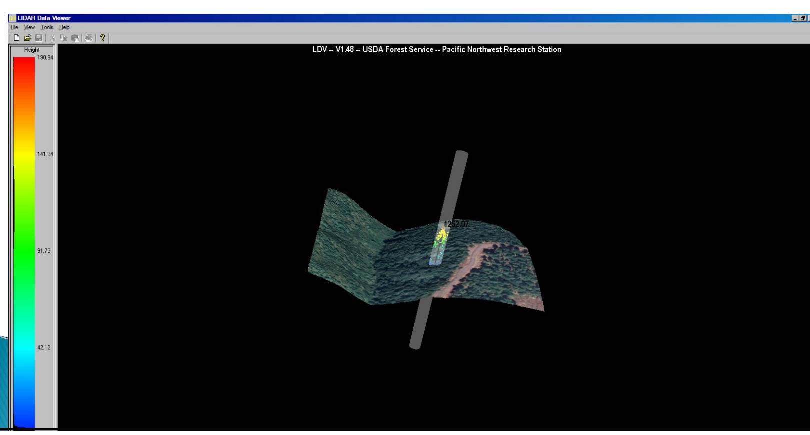
Goal of Project

- Test hypothesis that the distribution of trees in the Camp Creek Project Area can be explained by analyzing geographic features.



Goal of Project

- We are interested in two geographic features. First, a trees distance to the nearest road. Second, the slope of the ground where the tree is located.



Importance of work

- Previous studies suggest that the presence of roads may impact ecological processes.
- Impacts roads have on a forest ecosystem can be analyzed using statistics.

Importance of work

- Forest management practices take into account geographic features that influence distribution of trees.
- Analyzing these influences using GIS will aid in decision making.

Software and processes

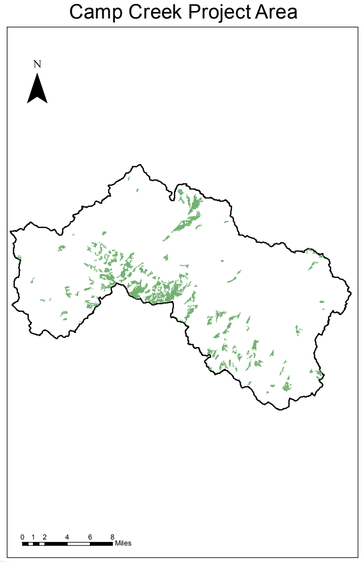
- Erdas Imagine
  - Classify forested and non-forested areas
  - Create tree crown layer using model
- Fusion
  - Create DEM and DSM
  - Visualize raw LiDAR data
  - Batch processing and clipplot.exe
- ArcGIS
  - Derive slope
  - Statistical analysis

Software and processes

Erdas Imagine

- Classify forested and non-forested areas thru an unsupervised classification

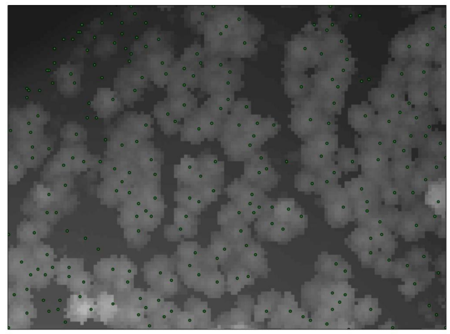
Camp Creek Project Area



Software and processes

Erdas Imagine

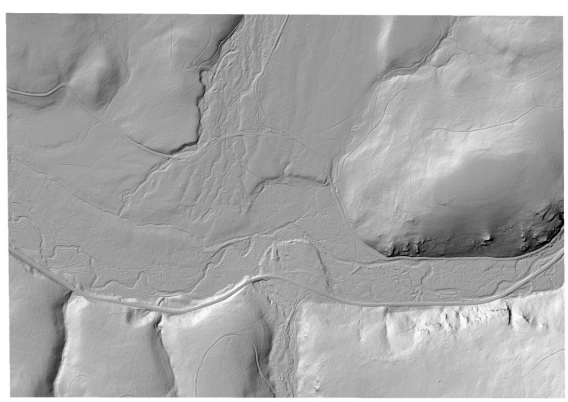
- Create tree crown layer using model
- Pixel with highest value is recorded as a tree



Software and processes

Fusion

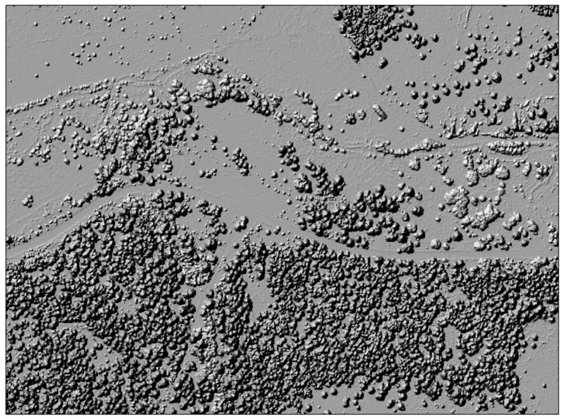
- Derive Digital Elevation Model from last return.



Software and processes

Fusion

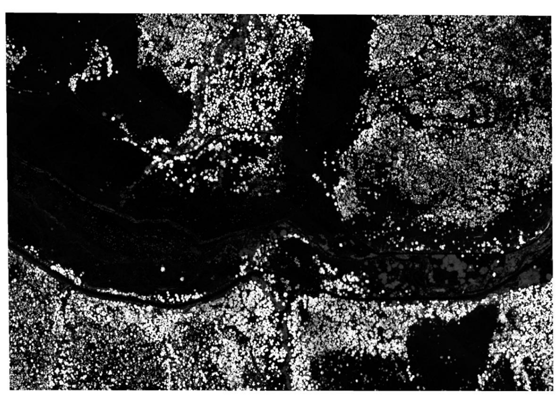
- Derive Digital Surface Model from first return.



Software and processes

Fusion

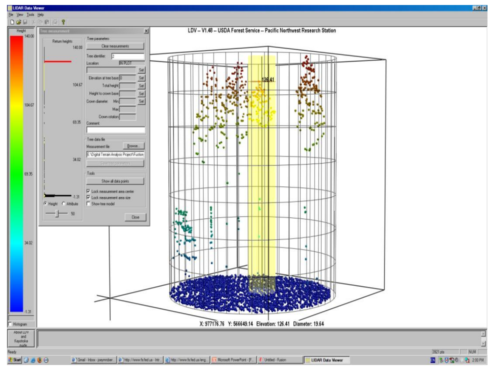
- Derive Surface Feature height using =DSM-DEM



Software and processes

Fusion

- Visualize LiDAR data
- Tree measurements



Software and processes

Fusion: batch files

clipplots.bat - Notepad

File Edit Format View Help

```
..\clipdata /shape:1 c:\lidar\SampleData\lda_4800k_data.lda c:\lidar\sampledata\clipplot1.lda
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..\clipdata /shape:1 c:\lidar\SampleData\lda_4800k_data.lda c:\lidar\sampledata\clipplot3.lda
```
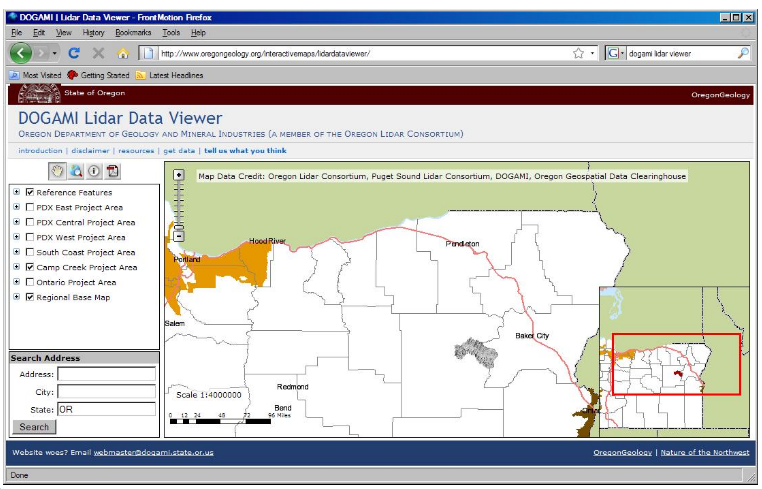

- Batch files allow automation when processing many LAS files.

Methods

- Study area
- Data sets
- Processing data
- Hypothesis testing

Study area



Source : http://oregongeology.org

Camp Creek : Malheur NF

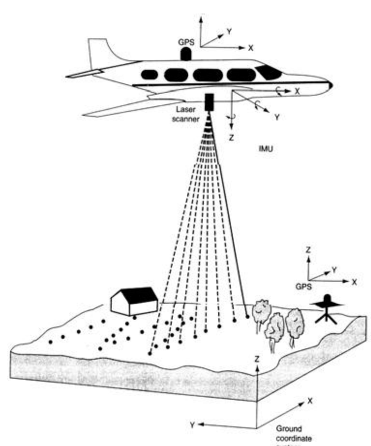
Source : Oregon Imagery Explorer (OSU)

Data sets

- Acquire LiDAR data.
  (Light Detection And Ranging)

-Calculates height of ground features by measuring time taken for laser pulse to return to sensor.

-The total pulse density for the Camp Creek Project Area is 8.11 points per square meter or about 0.75 points per square foot.

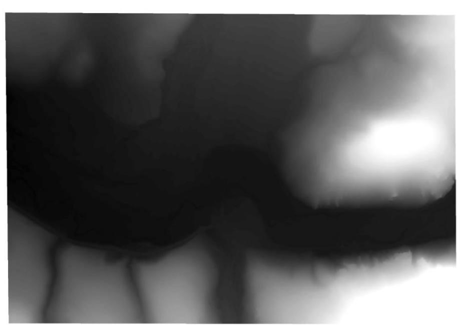


Processing data

Erdas Imagine

- Create DEM / DSM of forest floor and canopy.
- Attempt to find the crowns of the trees and determine tree height using Erdas and processed LiDAR data.

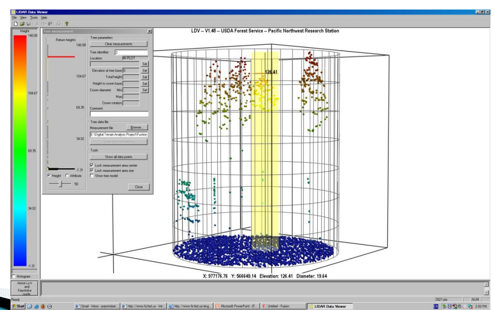
Processing data



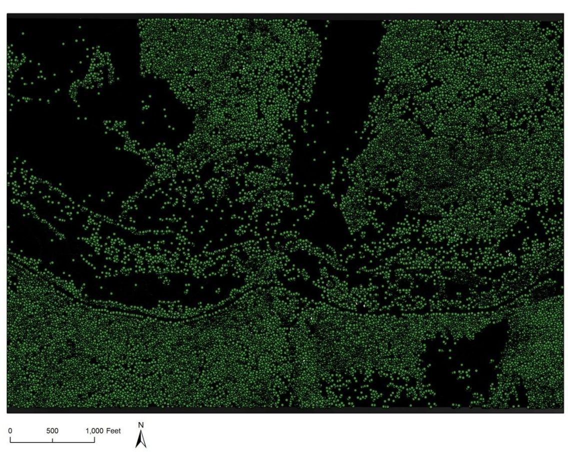
Derived bare earth DEM

Processing data

- Viewing raw data in Lidar Data Viewer
- (HH DSM – BE DEM) allows calculation of tree heights



Tree Crown Points

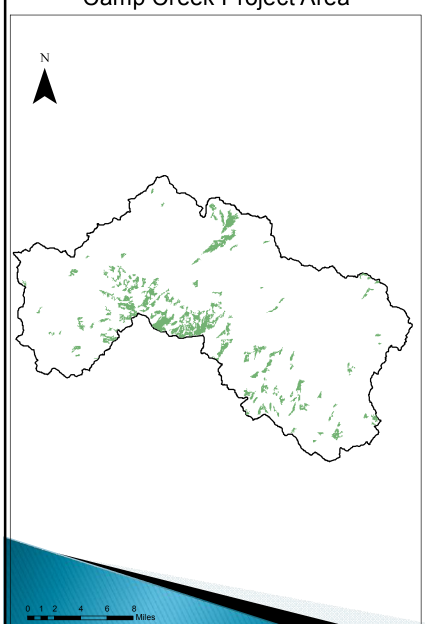


Points Located, Full Extent

Challenge

- Some of the points placed in ERDAS Imagine
  - Not Trees (looks for highest point).
  - QA/QC necessary to find these points.

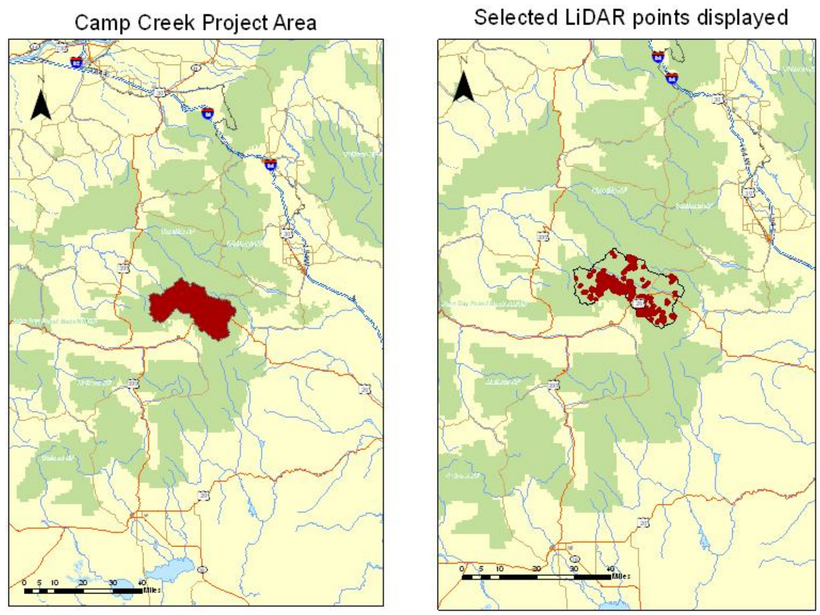
Camp Creek Project Area



Data sets

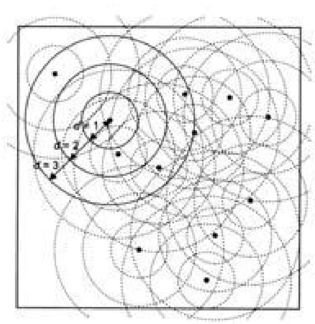
- Acquire LandSat data.

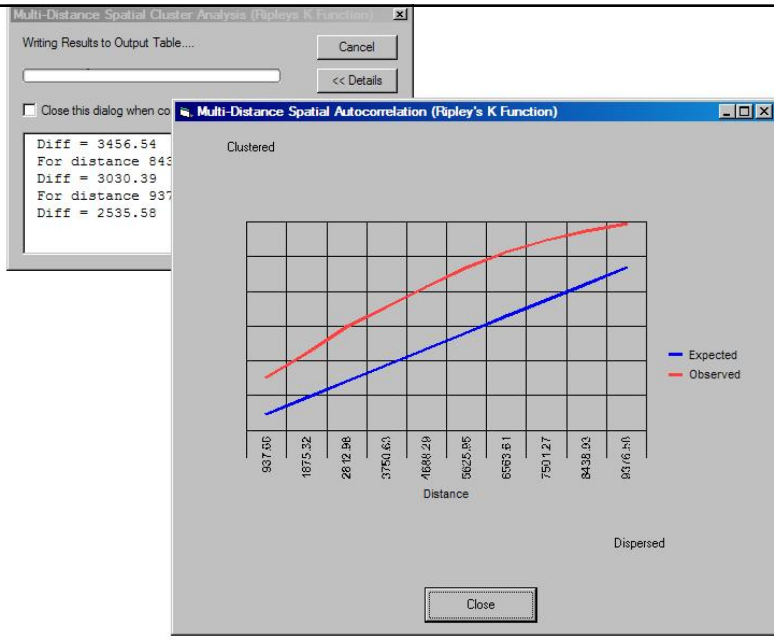
-Unsupervised classification performed.
-Classes include forested and non-forested areas.
-Forested areas clumped and sieved to Include only areas larger than 10 acres.
-Clipped LiDAR data to this the forested area class.



Hypothesis testing

- Ripley's K-function
- Measures the number of points located within circles of defined radius.
- Distance information about the entire dataset is explored.

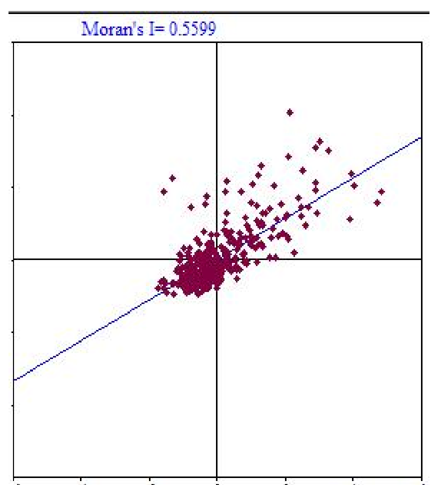




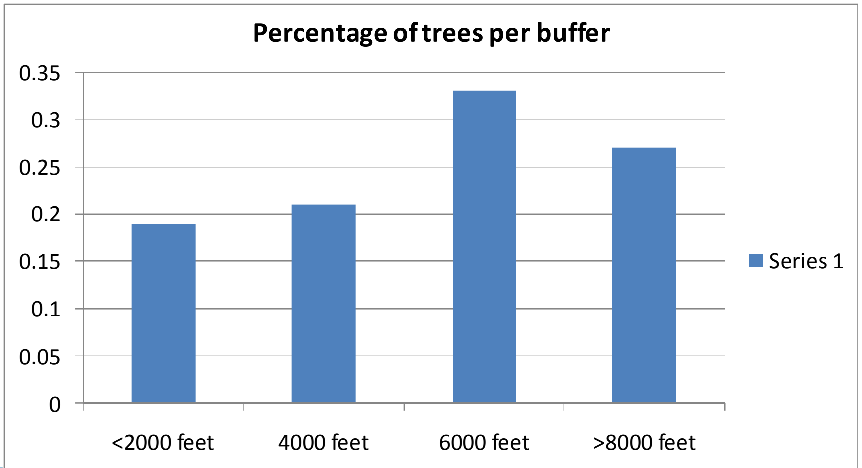
Ripley's K-function

Hypothesis testing

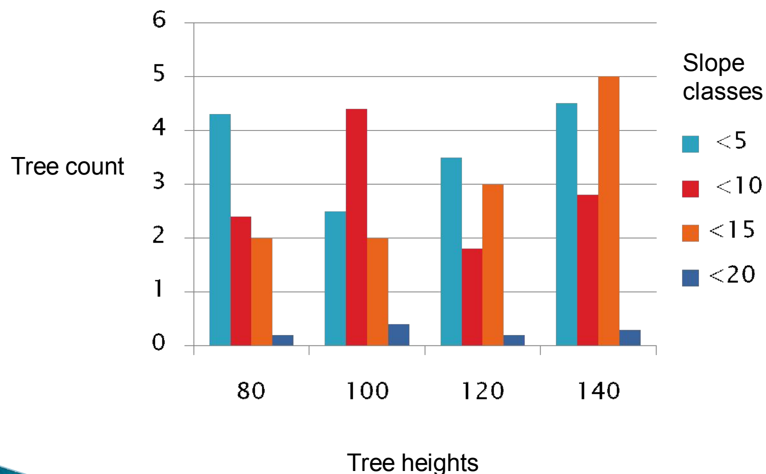
- Moran's I
- Measures autocorrelation of data
- Our data shows positive autocorrlelation



Tree count in road buffers



Average tree count in slope classes



Results and discussion

- Ripley's K-function suggests clustering in tree distribution.
- Reject Null hypothesis.
- Larger percentage of trees found farther away from roads.

Results and discussion

- Moran's I suggests autocorrelation in data.
- Larger percentage of taller trees are found in the higher percentage slope classes.

Strengths and limitations

- Field work is not always a viable option due to many conditions:
  - Time
  - Money
  - Physical Conditions
- However….

- Processing of LiDAR data is computationally intensive.

Conclusions

- In this study site the trees are clustered. Proximty to roads can explain this clustering.

- There is autocorrelation in our data. Slope can help explain this autocorrelation.

References

- Department of Geology and Mineral Industries. "LIDAR REMOTE SENSIING DATA COLLECTION Camp Creek, Oregon." (2008).
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- Dubayah, Ralph, and Jason Drake. "Lidar Remote Sensing for Forestry Applications." College
- Park, MD, University of Maryland, Department of Geography.
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- Renslow, Mike. "Evaluation of Multi-Return LIDAR for Forestry Applications." (2000): 1-19. Report Prepared for: The Inventory & Monitoring Steering Committee
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