

Biomass Inventory by UAV, Ground truth, LIDAR point cloud generation

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What is Sweet Sense ?

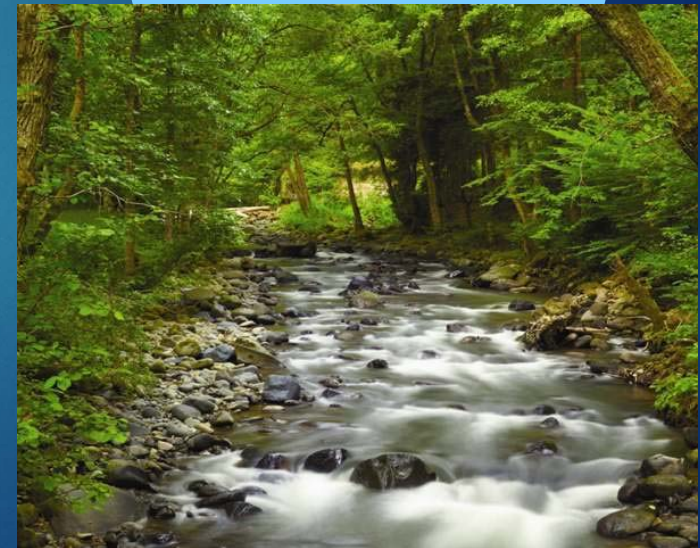
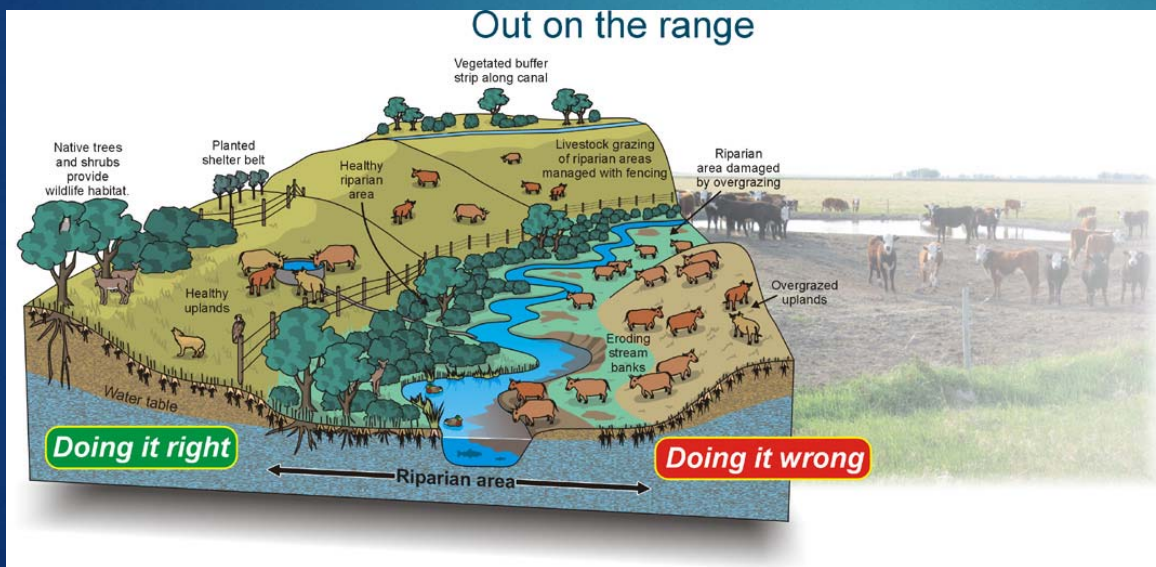
Sensors in Service of Global Health

- Design
- Create
- Monitor
- Respond
- Readjust



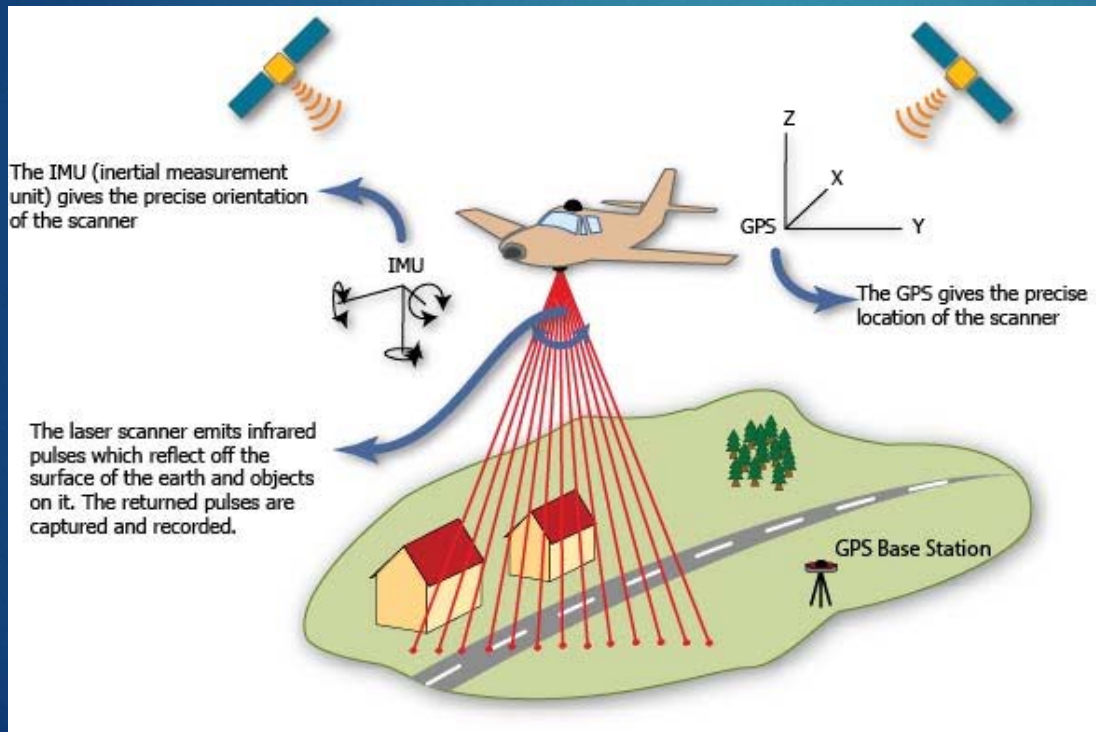
What Was our Goal?

- ▶ Collaboration with Fresh Water Trust, Oregon State University, and Portland State University
 - ▶ Location: Cedar Creek Springfield Oregon
 - ▶ Monitor Bio-Mass vegetation and compare that to ground truth data collected by the Fresh Water Trust



LiDAR

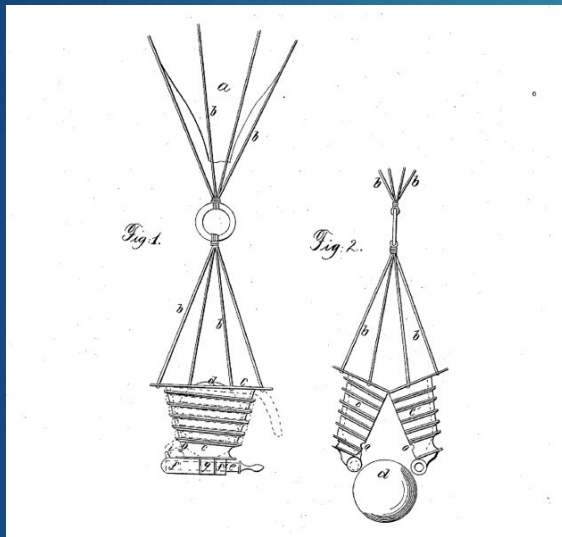
Light Detection And Ranging



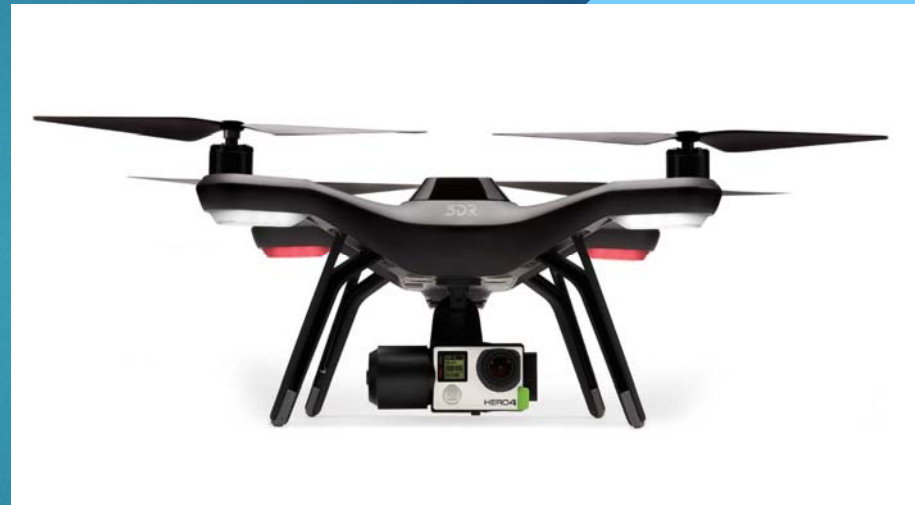
FOUR PARTS

LiDAR Unit Scans Ground
Global Positioning System
Inertial Measurement
Computer

Unmanned Aerial Vehicles (UAV)

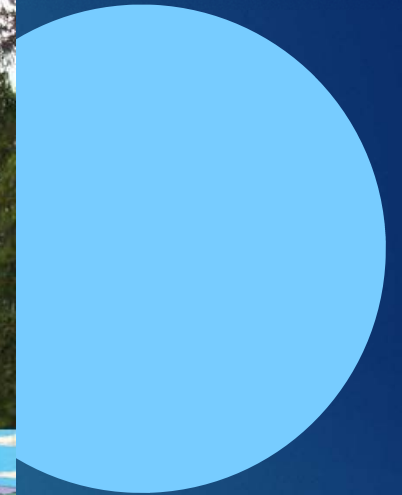


1860

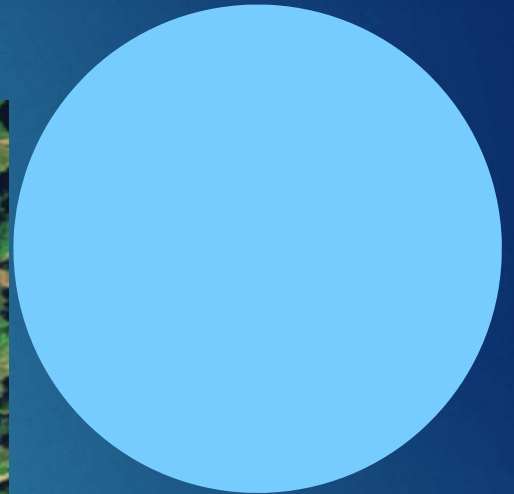


Present Day

Spring Field Oregon



Ground Control Points



Ground Control Points



In order for aerial imaging to be of any use from a spatial perspective, the images need to map to real world locations.

Spatial Perspective

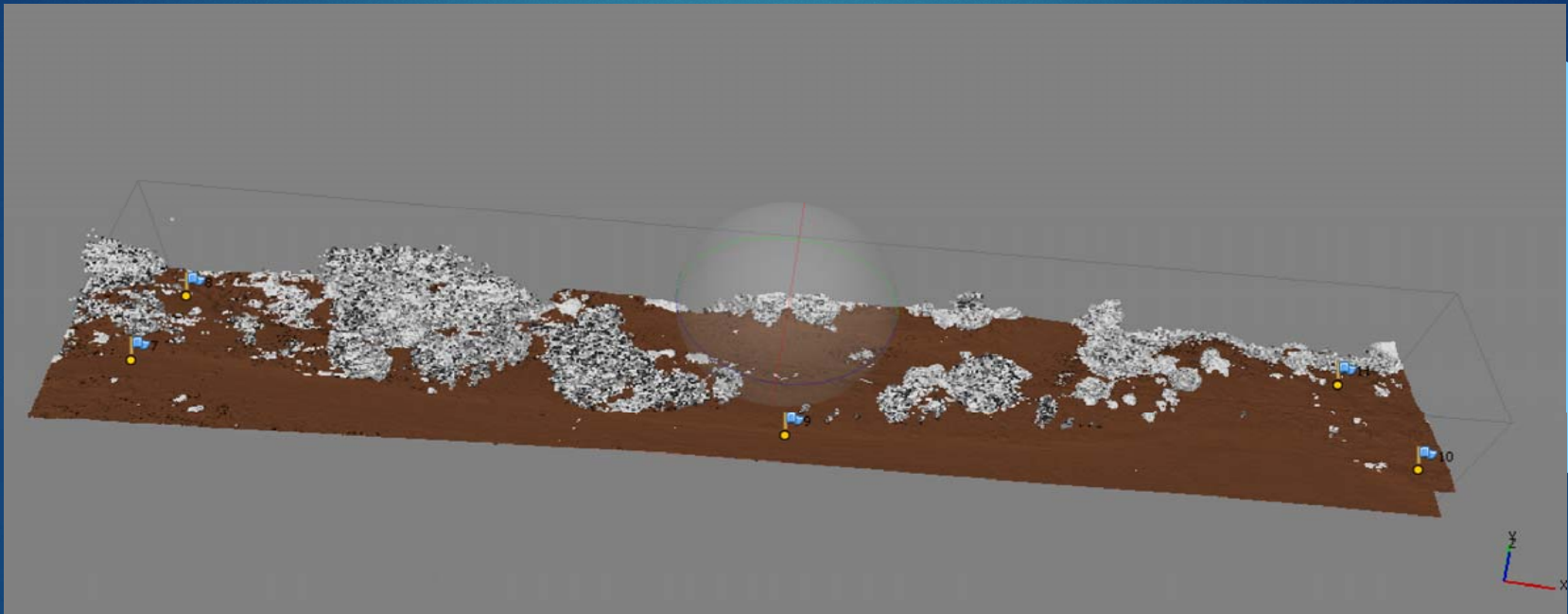


Structure From Motion

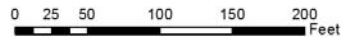
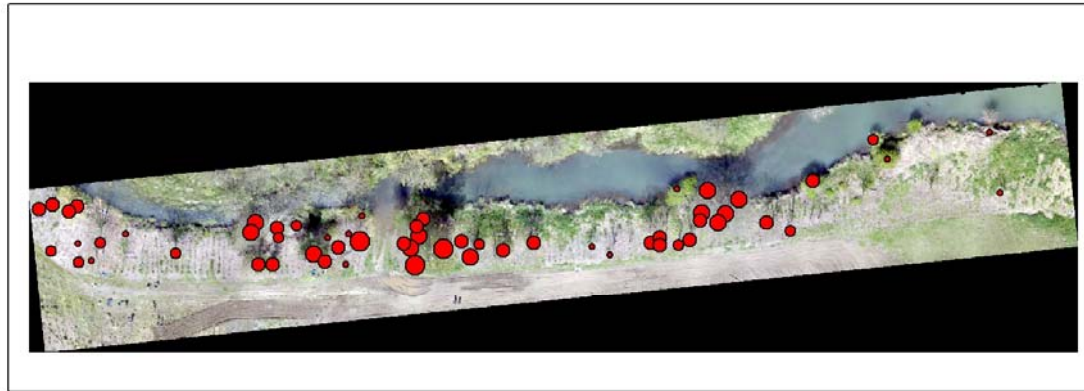


By taking multiple photographs at the same moment, objects in motion can be captured and make a 3D reconstruction

3D Reconstruction



Height Reconstruction



Legend

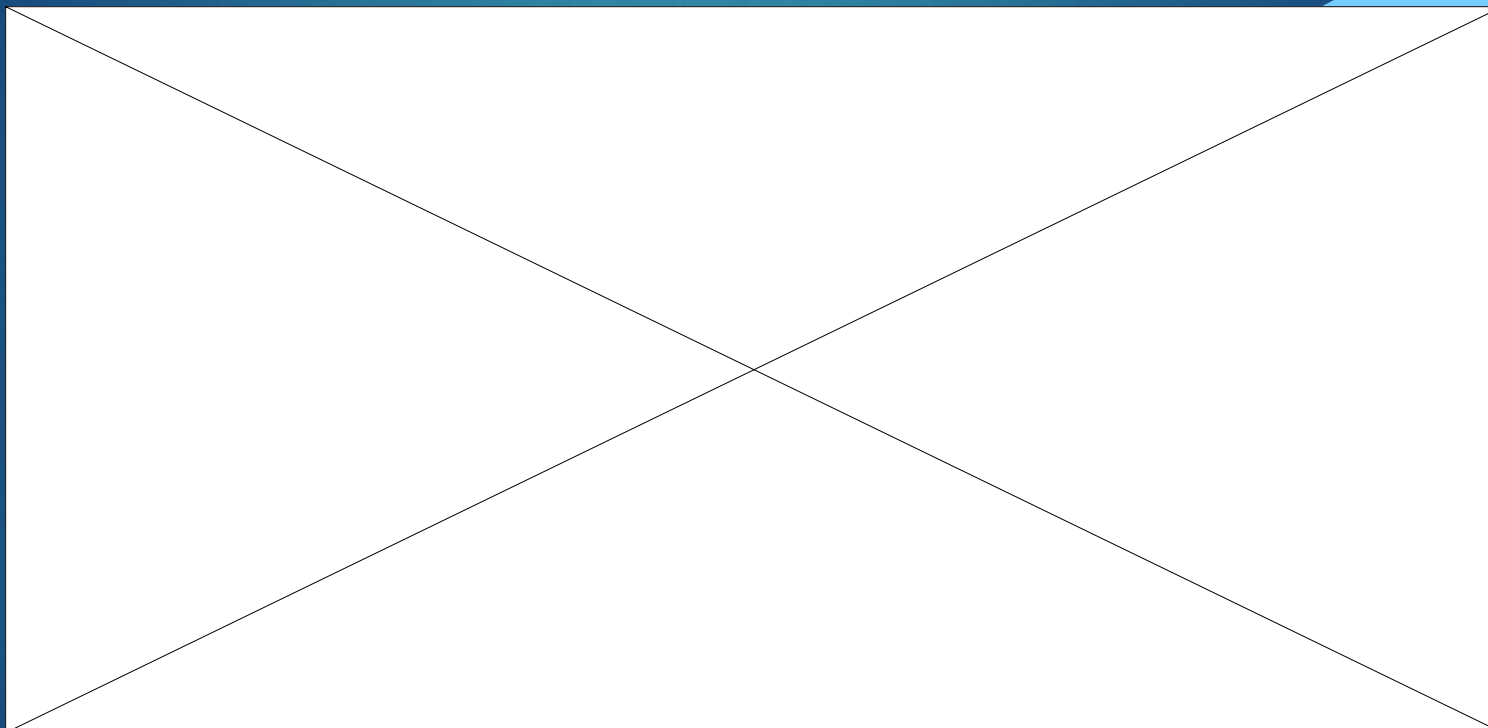
Height

- 7.00 - 11.00
- 11.01 - 16.00
- 16.01 - 32.00
- 32.01 - 46.00
- 46.01 - 74.02

3D Imaging



3D Reconstruction/Dense Cloud



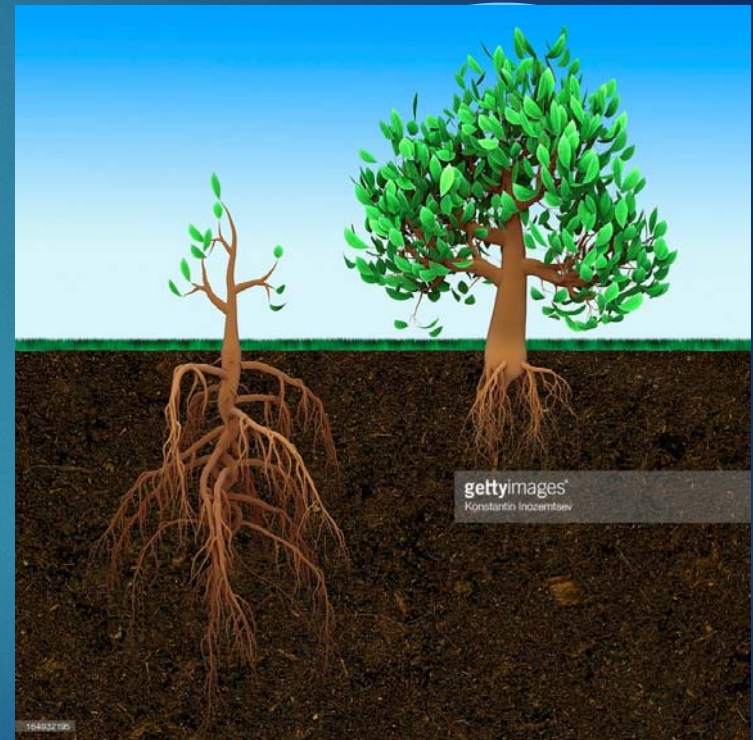
Biomass Results 3D

- ▶ Trees 7 ft taller

89.3%

- ▶ Smaller than 7 Feet

Issues



Thanks To :

- ▶ National Science Foundation
- ▶ Portland State University
- ▶ Research Experience For Undergraduates
- ▶ Evan Thomas, Emily Bedell, Taylor Sharpe
- ▶ Audrey Siefert



References

- ▶
- ▶ [1] Ritter, Brian. *Use of Unmanned Aerial Vehicles :(UAV) For Urban Tree Inventories* (2014). All Theses. Paper 1890
- ▶ [2] Stefano Puliti, Hans Ole Orka, Terje Gobakken, and Erik Naesset. *Inventory of small Forest Areas Using an Unmanned Aerial System* (2015). All Theses. Paper 2072
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- ▶ [5] Sean Bemis, Steven Micklethwaite, Darren Turner, Mike James, Sinan Akciz, Sam Tiele. *Ground-based and UAV-Based photogrammetry: A multi-scale, high-resolution mapping tool for structural geology and paleoseismology*. All Theses. Paper