Experiences in the in-field utilisation of Fuels3D

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Overview

- Fuels3D background
  - Principles
  - Research to date
- Utilisation Trial
  - Approach
  - Current status
  - Expected outcomes

Background

Fuels3D Principles

- Fuels3D is a set of methods for the collection 3D data and the processing of that data to inform our fuel environments

- Fuels3D consists of two main modules

  Fuels3D point cloud generation; and

  Fuels3D point cloud analysis.

Point cloud generation

- A number of technologies exist for generating point clouds
  - Laser Scanning
  - Structured light cameras
  - Photogrammetry/Computer Vision/Structure from Motion
- Several platforms exist to carry this technology
  - Drones
  - Tripods
  - People
- Structure from motion technique is **currently** most feasible infield use
  - Low cost technology
  - Easy to understand capture*
  - Solving issues surrounding scale /environmental conditions key to success

Point cloud processing

- Point clouds captured by different technologies similar but not the same

- Methods developed to extract features of interest in different environments
  - Fuel strata
  - Status (live/dead)
  - Cover
  - Height
  - Change
  - Stratification
  - Bark type

- Significant focus on replicating the fuel hazard guide metrics

Research Activities

Fuels3D capture restrictions

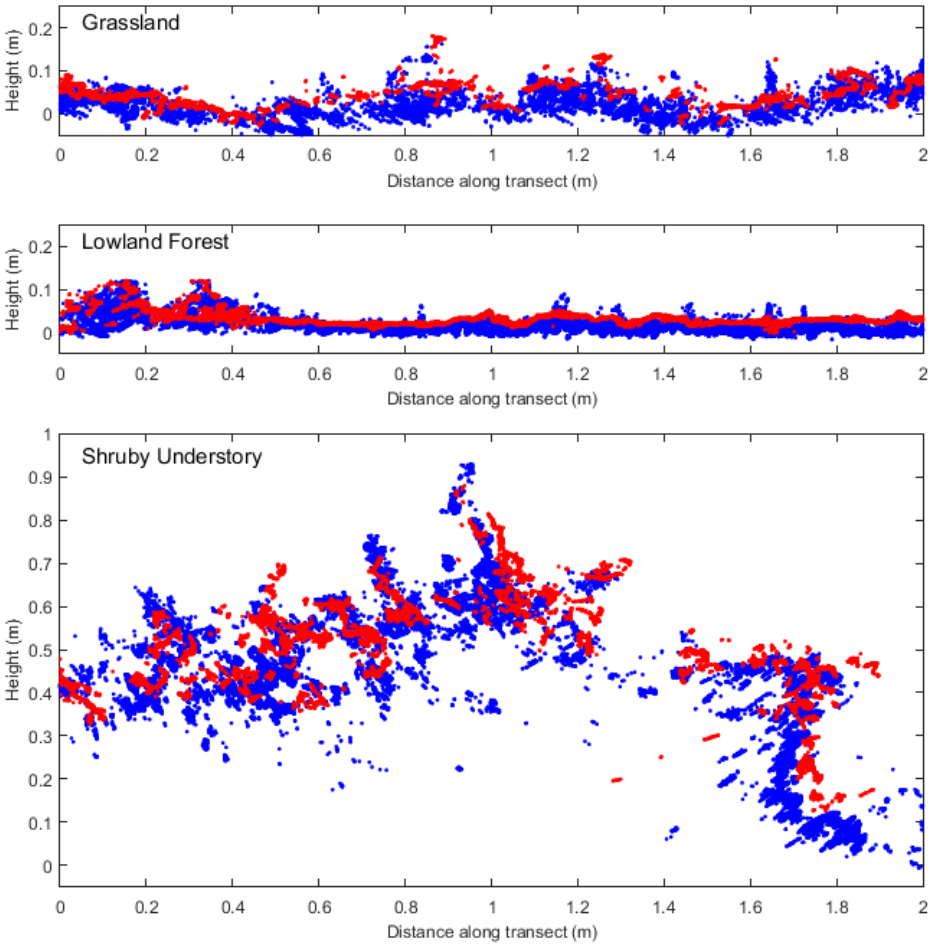
TLS point clouds

Result of 4 merged scans from a Trimble TX8 scanner

29 – 46 points per cm

Image based point clouds

16 – 58 points per cm



Fuels3D Precision

sensors

MDPI

Article

Investigating Surface and Near-Surface Bushfire Fuel Attributes: A Comparison between Visual Assessments and Image-Based Point Clouds

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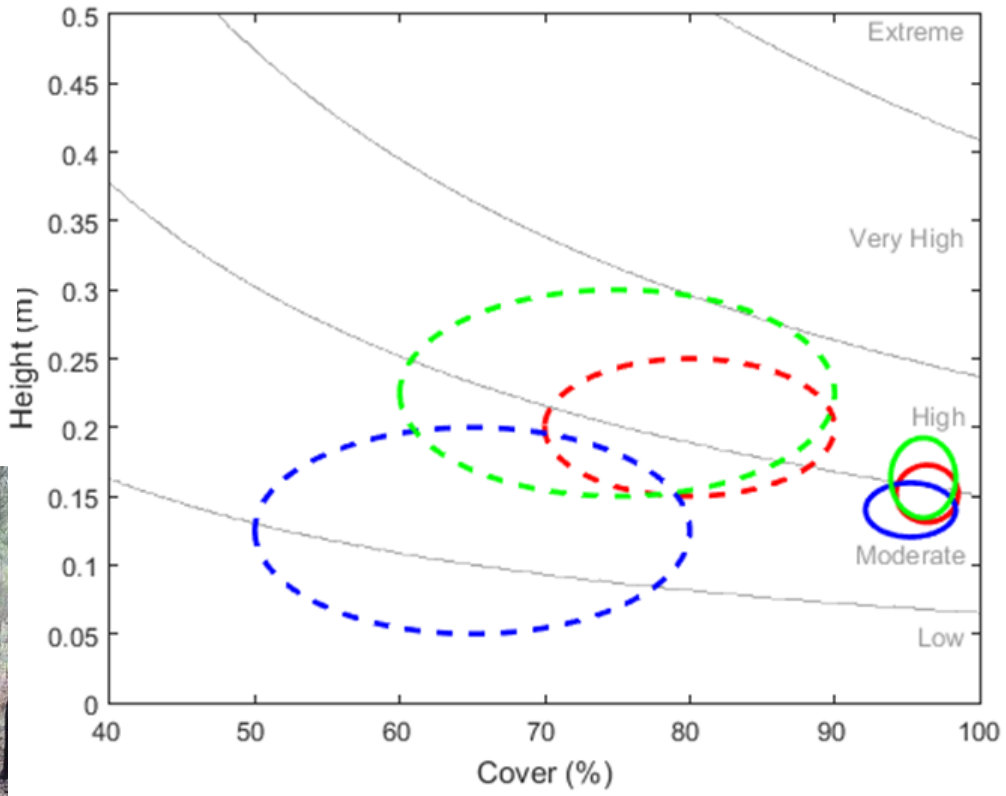
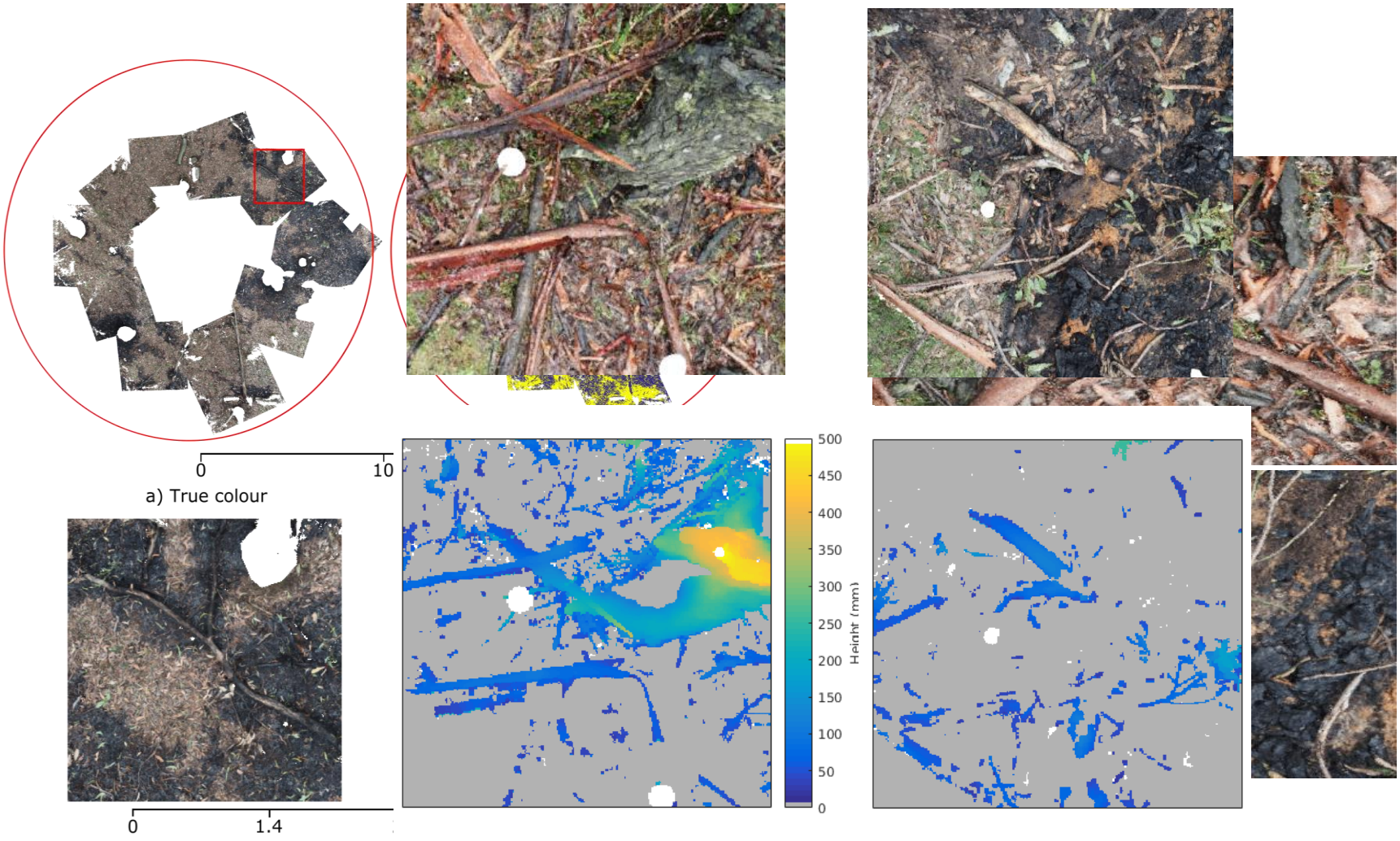
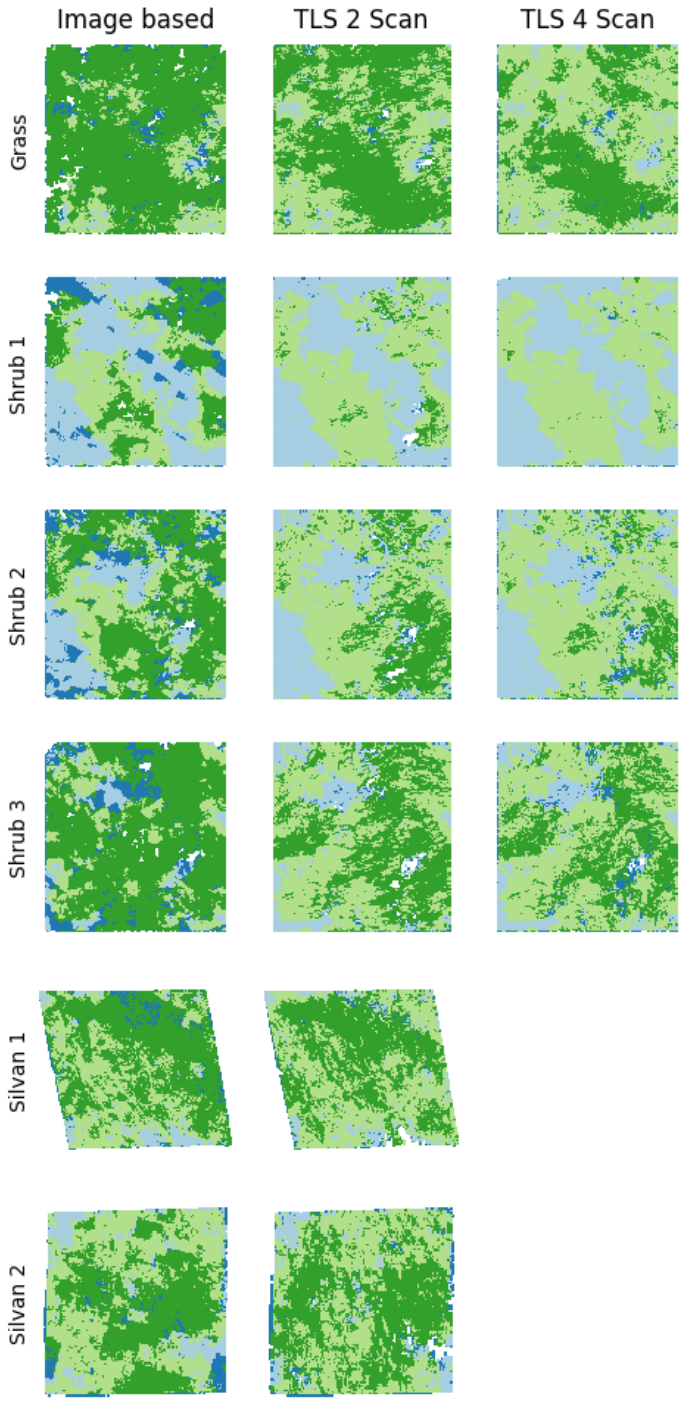


Planned burn efficacy



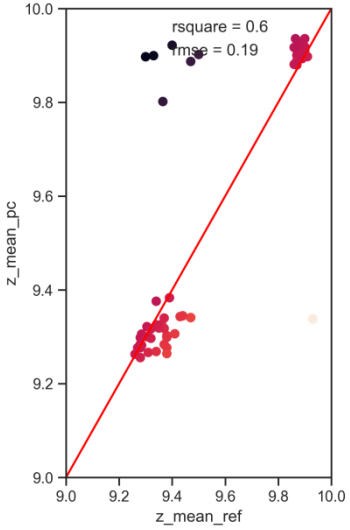
Accuracy

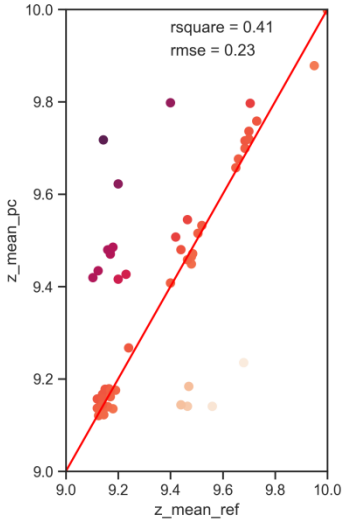
- First step in any point cloud processing approach is knowing where the ground is
- Aim to determine the accuracy with which the ground can be found with different
  - Technologies
  - Vegetation environments
  - Cover conditions



Accuracy

- Grid point intercept method used to validate point cloud (near-surface and surface)
  - 64 sample points
  - Spaced approximately 50mm apart in 0.5 x 0.5m frame
  - Measured height of intercept on rod to nearest cm.
- Varying correlation depending on complexity of vegetation.
- Frame has minimal effect on point cloud generation
- Wind effects the ability to complete point matching





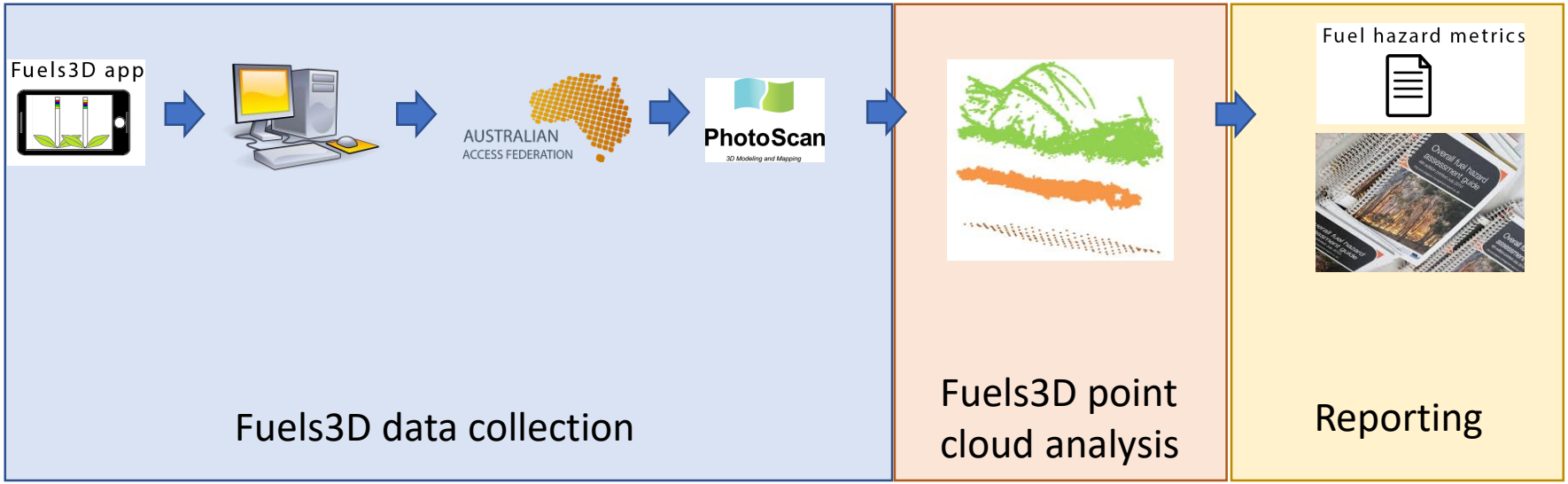
Environmental conditions

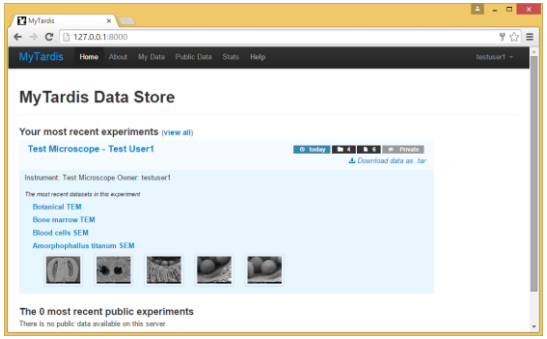
- Testing the limits of point cloud capture technology with simulated fuel/vegetation beds

- Effect of wind and inconsistent lighting

Utilisation Trials

Utilisation Workflow

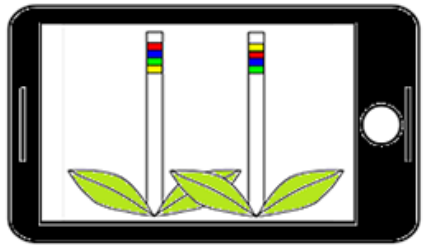




Data collection

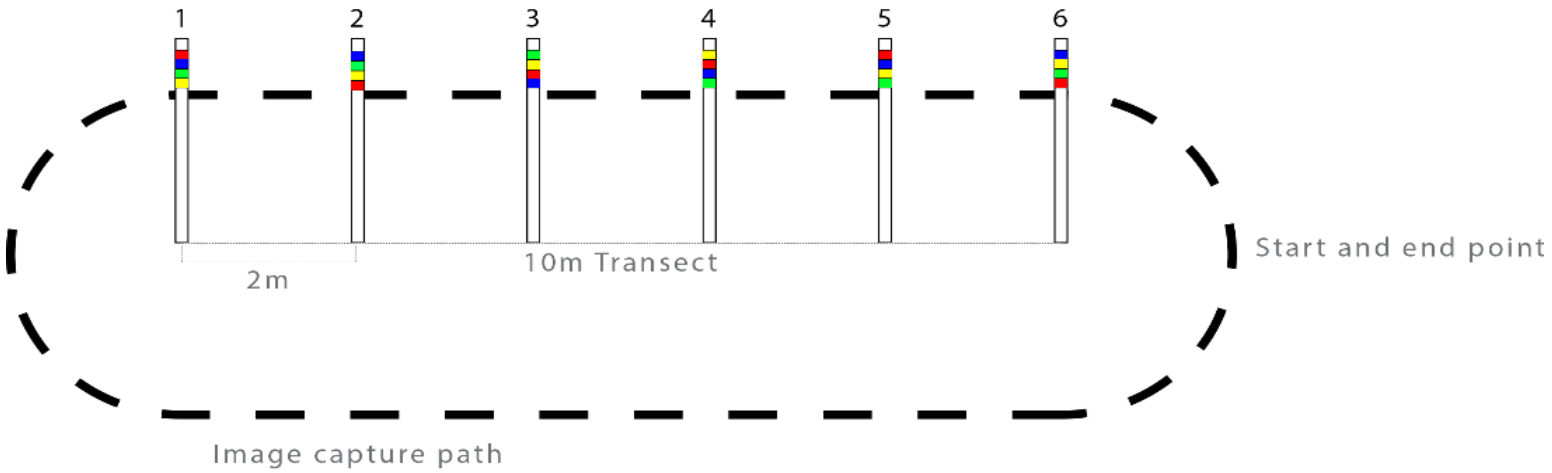
- Smartphone based data capture
  - Smartphone primarily acts as a data capture and organization device
  - No end-to-end workflow implemented
- Data is captured in **projects** which represent an area (burn area, forest etc.)
- Within projects, **samples** are collected which currently includes;
  - A set of photos
  - Metadata concerning
    - Plot location
    - Time of capture
    - Fuel details (for utilization trial)

Fuels3D app

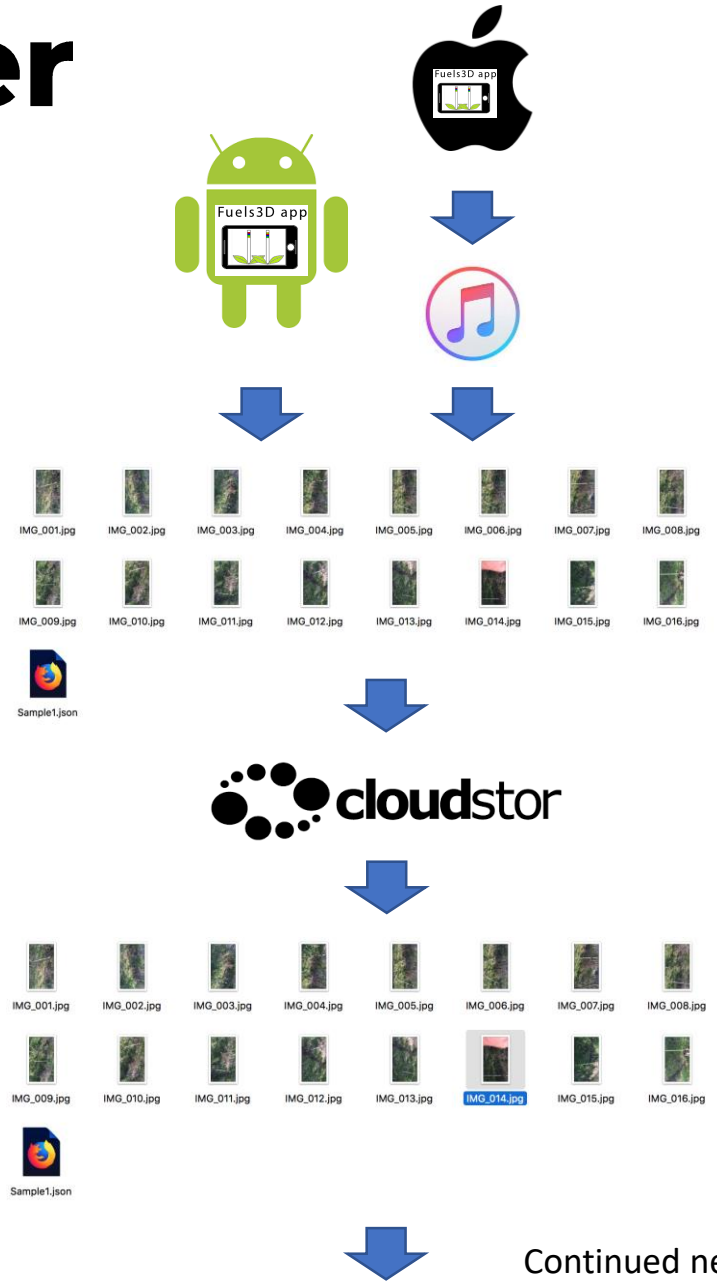


Data collection

- The data collection method has been designed to be easy to follow and flexible within different environments.
  - Transects can be any length
  - Contain 2 – 6 target poles



Data transfer



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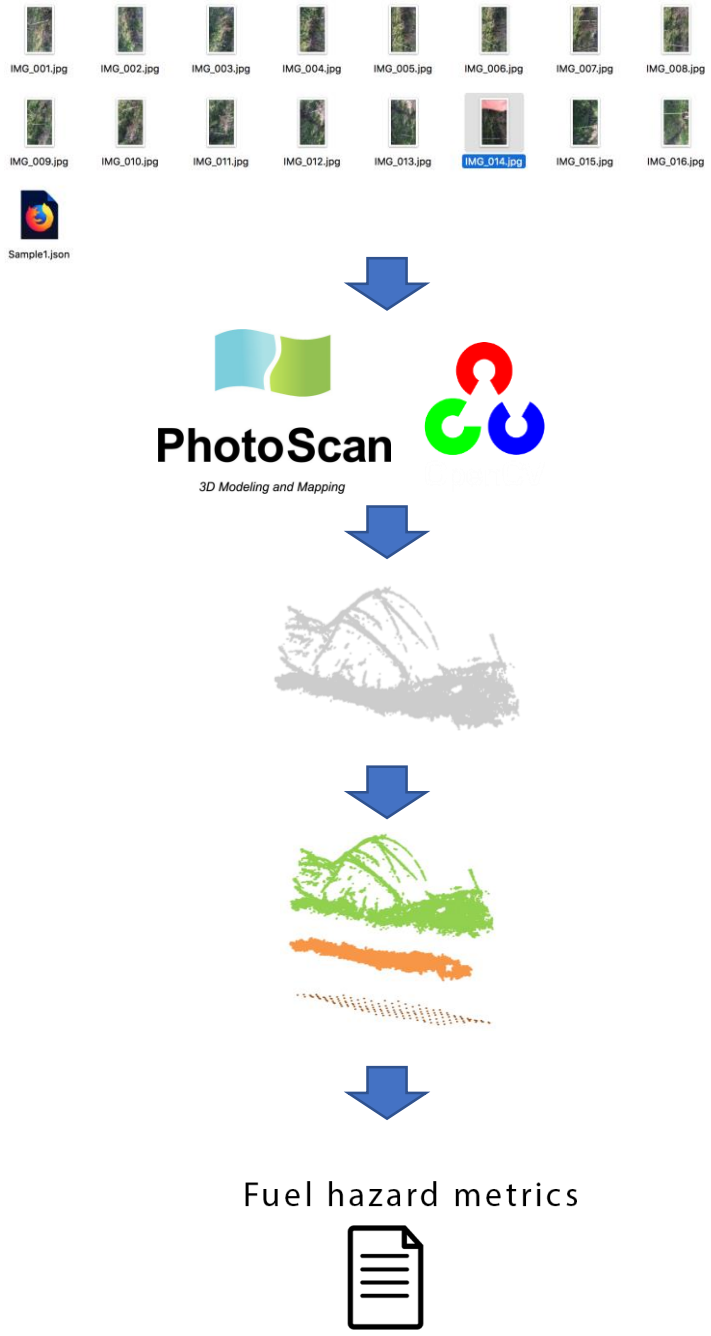
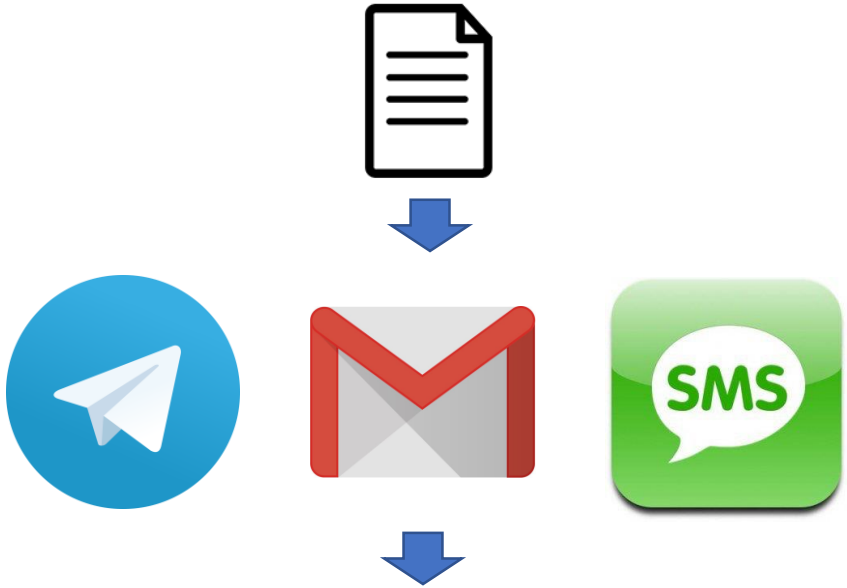
Point cloud generation

Point cloud analysis



Reporting

Fuel hazard metrics



Utilisation trials – current status

- Four agencies participating in trial (as above)

- 14 Projects received thus far

- These will be processed in the coming weeks

- Currently QA occurs at a number of stages to determine issues

Thank you