Creating a 3D Digital Twin of Copeland Creek Using Drone LiDAR Data

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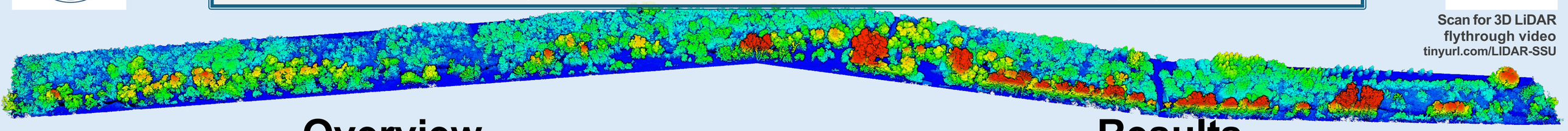
Scan for 3D LiDAR flythrough video
tinyurl.com/LIDAR-SSU



Overview

- High-resolution digital twin of Copeland Creek created using drone LiDAR
- 3D point cloud used to model terrain and vegetation structure
- Data collected in GEP 380 Environmental Remote Sensing

- Demonstrates applications for:
  - Ecological restoration
  - Hazard assessment
  - Environmental monitoring
  - Wildfire fuel mapping

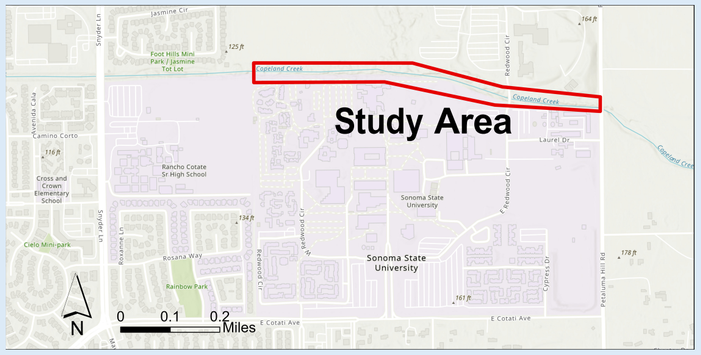


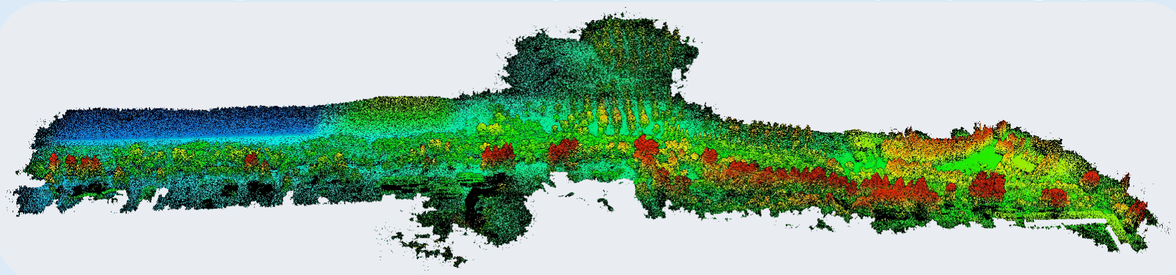
Fig. 1: The Copeland Creek study area and Sonoma State Campus

Data Acquisition

Fig. 2: DJI Matrice 200 Quadcopter with RESEPI XT-32 LiDAR

- Drone-mounted remote sensing system
- Emits laser pulses; return time → distance
- Generates dense 3D point cloud
- Captures terrain and vegetation structure
- Enables rapid, high-resolution mapping
- Effective in complex environments
- Point cloud processed using *Lidar360*

Fig. 3: LiDAR point cloud colored by elevation, from low (blue) to high (red).



Results

1. Digital Elevation Model

LiDAR-derived DEM shows terrain, channel form and surface structure (Fig. 4)

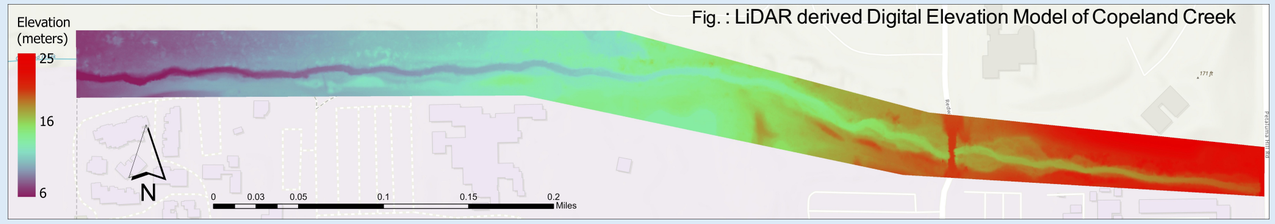


Fig. : LiDAR derived Digital Elevation Model of Copeland Creek

2. Creek Cross Section Profiles

Profiles from DEM show channel depth and bank geometry (Fig. 6)

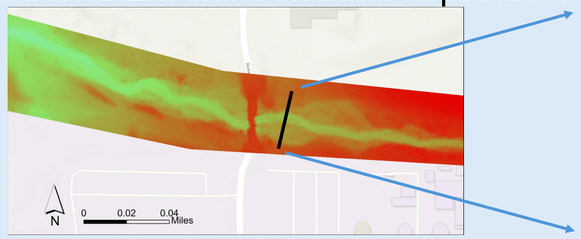


Fig. 5: Creek Cross Section Profile Location

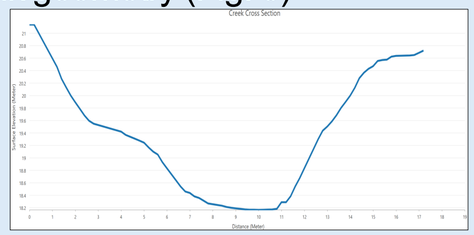


Fig. 6: Cross Section Profile generated from the DEM

3. Tree Segmentation and Analysis

- Trees above 2 m were segmented across the study area (Figs. 1 & 7)
- Tree height extracted for all identified trees (Fig. 8)
- Additional metrics derived:
  - Location (X, Y, Z)
  - Crown height, area, and volume

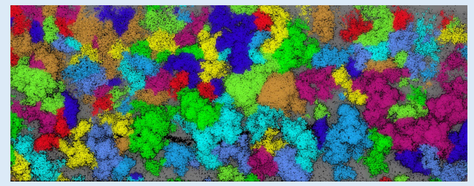


Fig. 7: A selection of segmented trees, each color represents an individual tree crown.

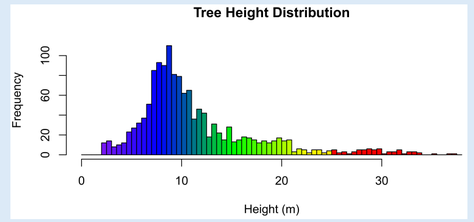


Fig. 8: Tree Height Histogram

4. Ladder Fuels & Vegetation

Ladder fuel density (1–4 m); higher values indicate greater fuel continuity (Fig. 9)

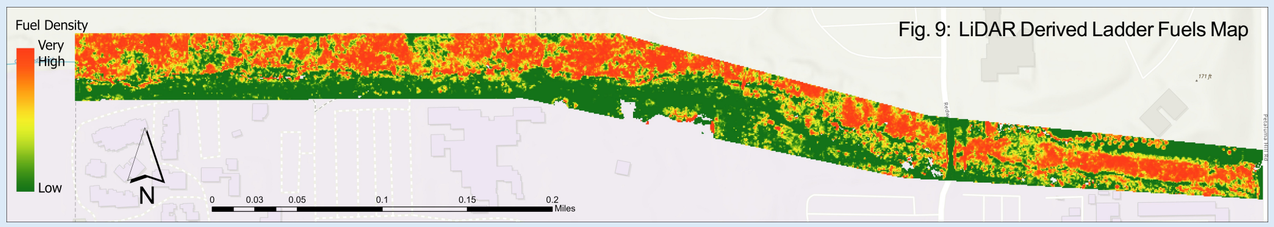


Fig. 9: LiDAR Derived Ladder Fuels Map