sUAS IMAGE ACQUISITION FOR NbS "Early detection of tree mortality" - DR3

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Objectives

Acquisition of comprehensive geospatial datasets enabling quantitative assessment of oak mortality patterns:

- **High-resolution photogrammetric products** for detailed canopy visualization and change detection
- **Multispectral imagery and Thermal Infrared** for modelling vegetation stress and calculating vegetation indices (NDVI, NDRE, etc.)
- **LiDAR point clouds** for precise 3D canopy structure analysis and mortality mapping

All data products were processed to achieve centimeter-level geometric accuracy using RTK-GNSS positioning and rigorous photogrammetric workflows.

Study Areas and Data Acquisition

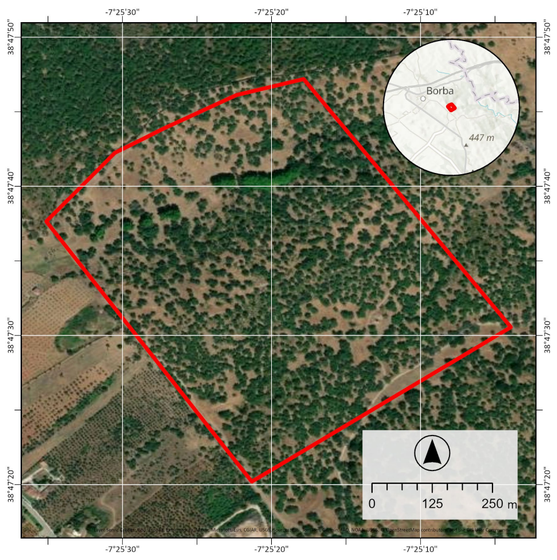
Alentejo region (Portugal), as DRYAD project's third demonstrative case (DR3)

PDA 1 – Companhia das Lezírias (CdL): 30 hectares surveyed July 14-15, 2025 (1,265 RGB images, 1,354 multispectral images, 394M LiDAR points)

PDA 2 – Vila Viçosa (VV): 35 hectares surveyed July 16-17, 2025 (636 RGB images, 659 multispectral images, 787M LiDAR points)



PDA 1 - Companhia das Lezírias Survey Area



PDA 2 – Vila Viçosa Survey Area

Methodology

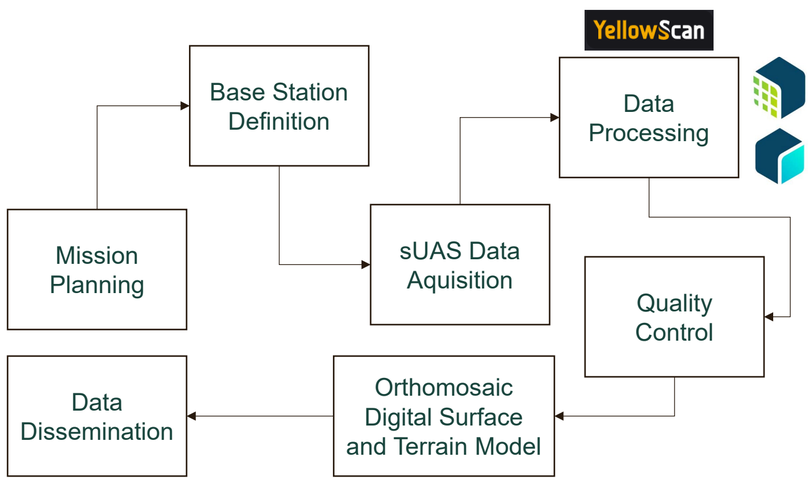
DR3 sUAS Survey

Photogrammetry - P1 – 120 m AGL
Side/Front Overlap 70%

Multispectral – 120 m AGL
Side/Front Overlap 70%

LiDAR - YSM – 80 m AGL
Side/Front Overlap 50%

Thermal – 120 m AGL
Side/Front Overlap 80%



A **DJI Matrice 300 RTK platform** integrated three complementary sensors: (1) Zenmuse P1 camera for ultra-high resolution RGB imagery (1.5-1.6 cm GSD), (2) Agrowing sextuple multispectral sensor capturing 14 spectral bands (2.2-3.0 cm GSD) for vegetation health assessment, and (3) YellowScan Mapper+ LiDAR system generating dense 3D point clouds (>1.1 billion total points) for structural analysis.

A **DJI Mavic 3T platform** integrated two complementary sensors: (1) a 48 MP wide-angle RGB camera providing high-resolution imagery at ~1.6–2.0 cm GSD for mapping and inspection, and (2) a radiometric thermal imager (640 × 512 pixels) capturing temperature with high sensitivity across the 8–14 µm range.



DJI P1



Sony ILX-LR1 with Agrowing Sextuple Lens

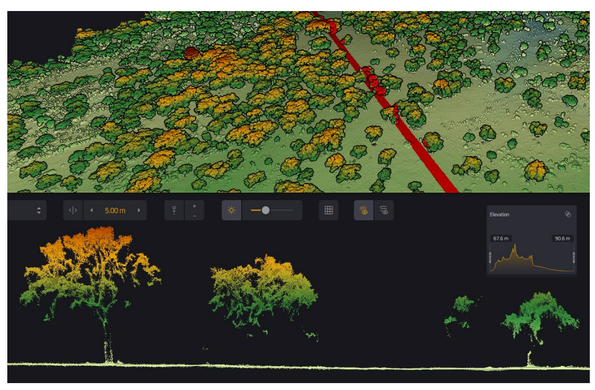


YellowScan Mapper +

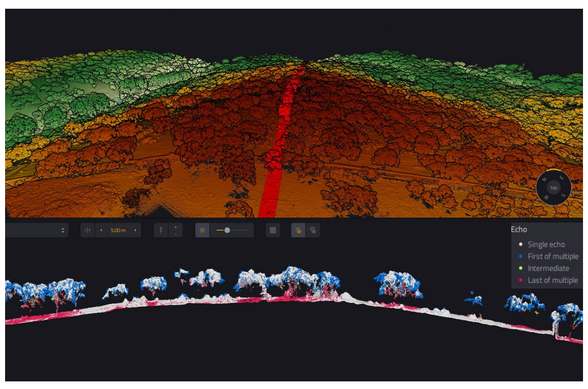


EMLID RS3 GNSS Sensor

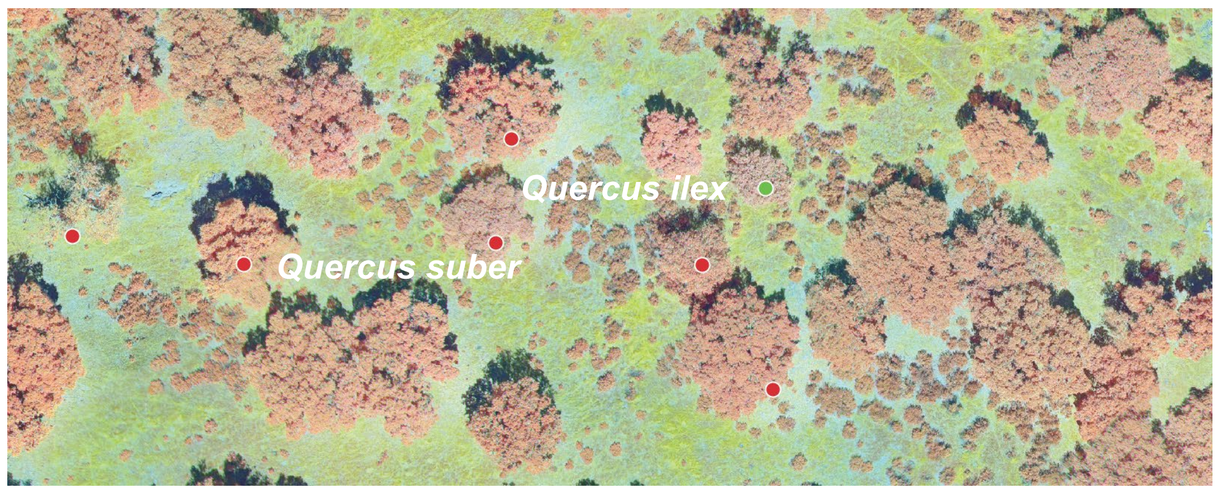
Results



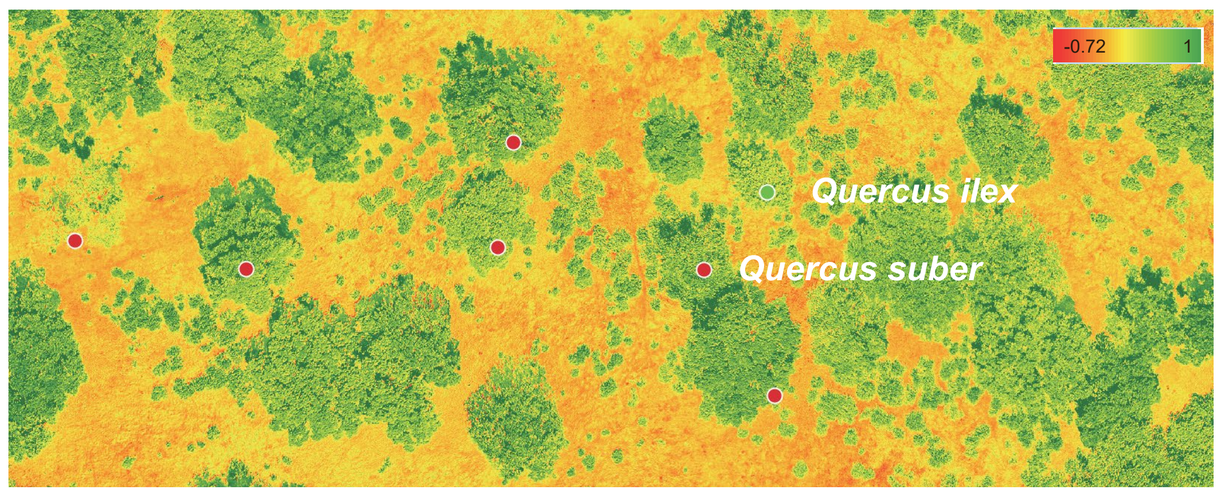
PDA 1 – LiDAR Point Cloud (elevation)



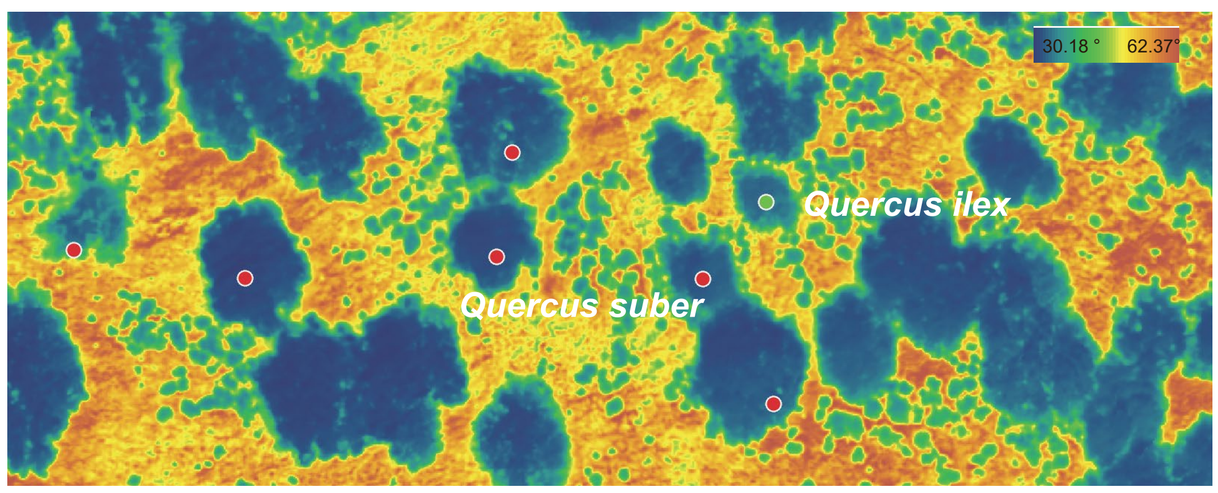
PDA 2 – LiDAR Point Cloud (Return nº)



PDA 2 – R (850 nm) G (560 nm) B (405 nm)



PDA 2 – Green NDVI Index



PDA 2 – Thermal Mosaic (Midday)

GNSS survey was performed using EMLID RS3 to map individual trees, acquiring information about tree species, biometric information and health state.

This comprehensive multi-sensor aerial survey employed state-of-the-art remote sensing technologies to acquire high-resolution geospatial datasets for developing nature-based solutions focused on early tree mortality detection.

PDA 1 - Report

PDA 2 - Report

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