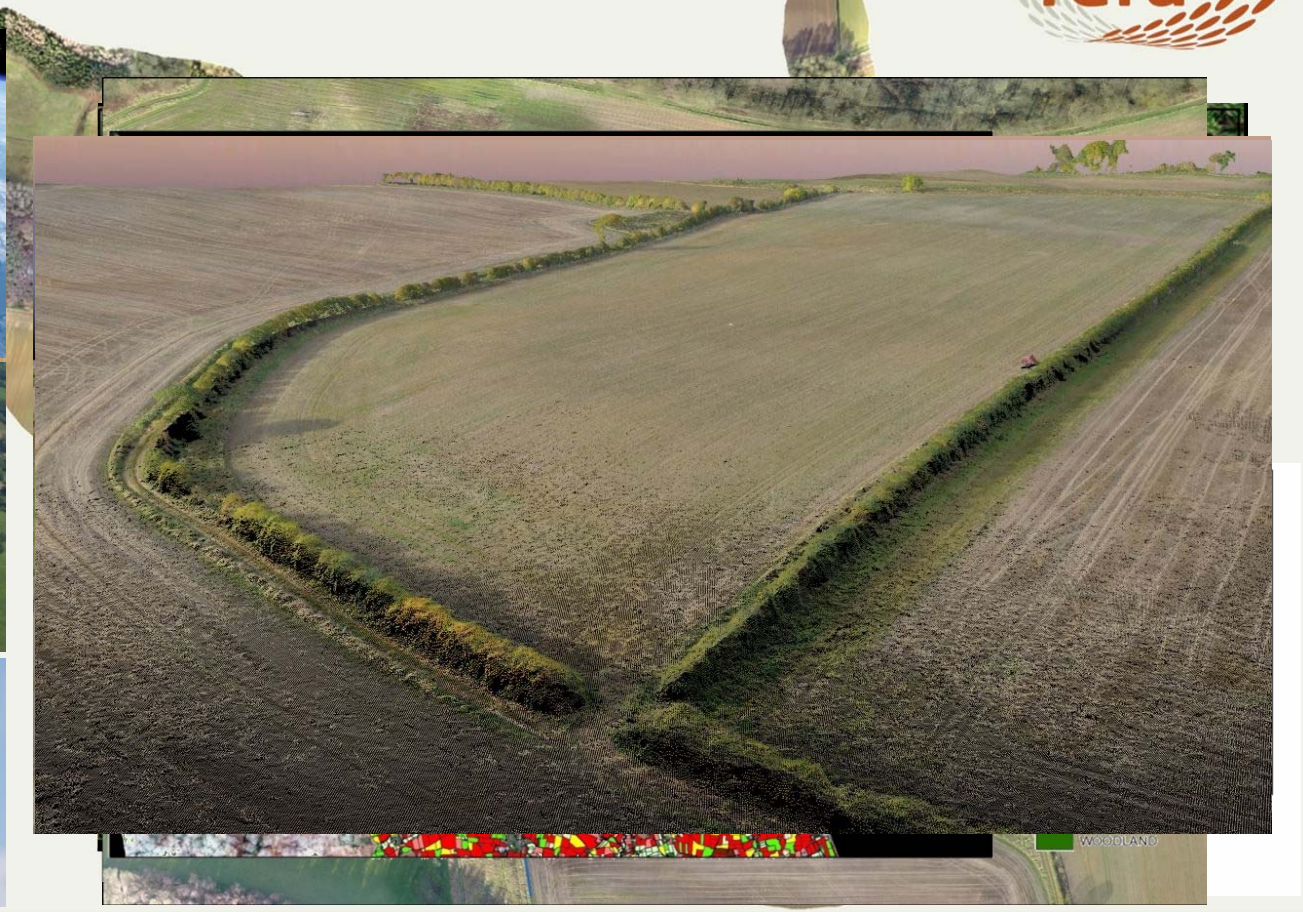
Remote Sensing at Fera

Paul Brown – GI Remote Sensing Scientist
Andrew Crowe – Senior Spatial data Scientist
Lee Butler – GIS Specialist

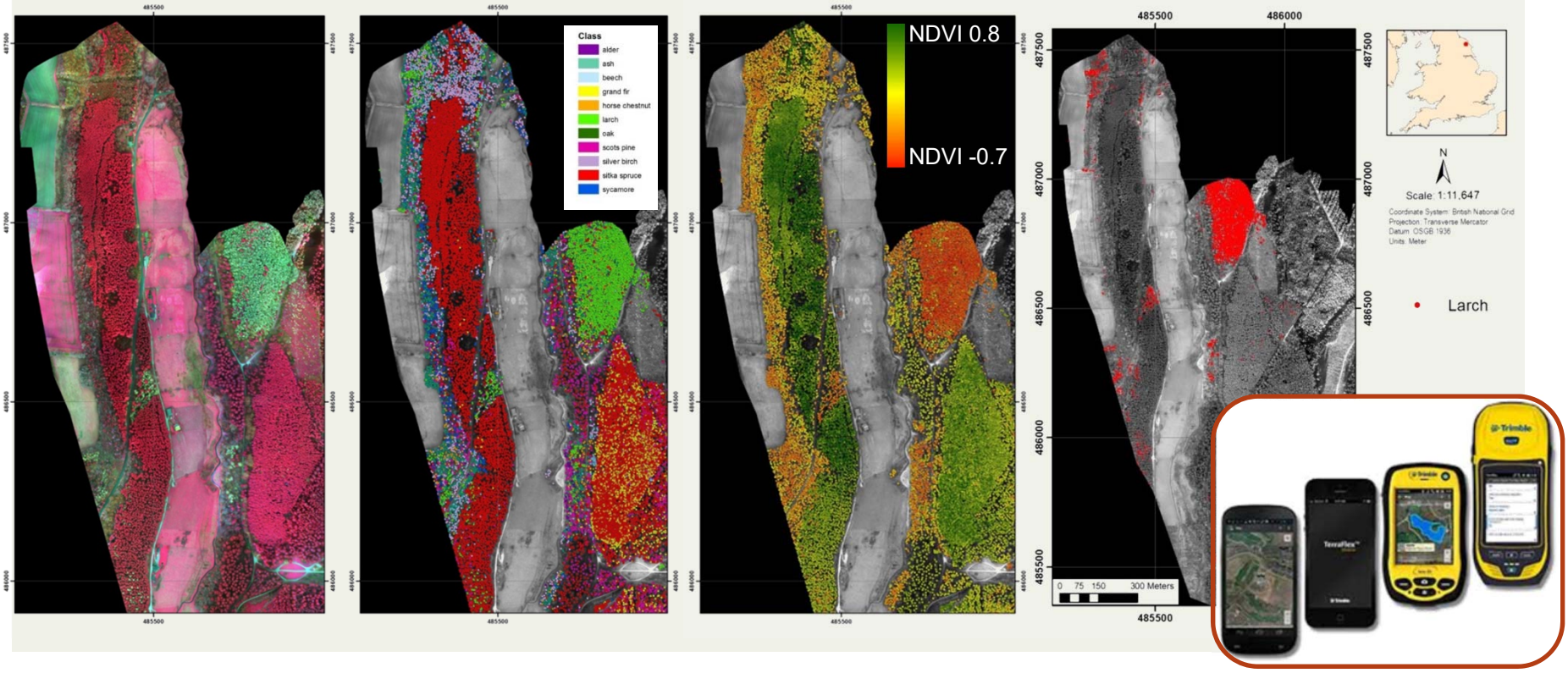
Platforms and Sensors – Example Projects

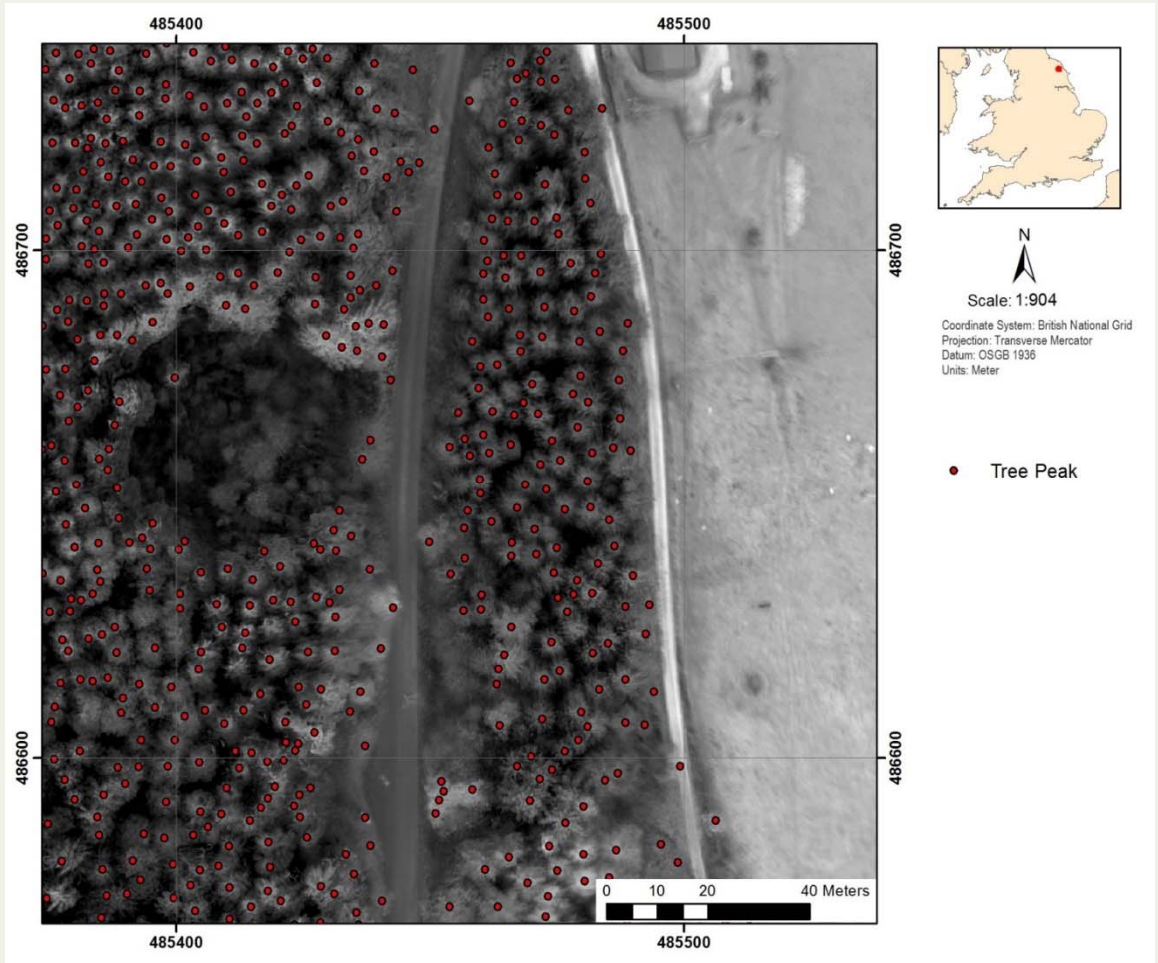


RS of Trees– Inspection targeting example

Tree Species Classification – Host Species Target Mapping

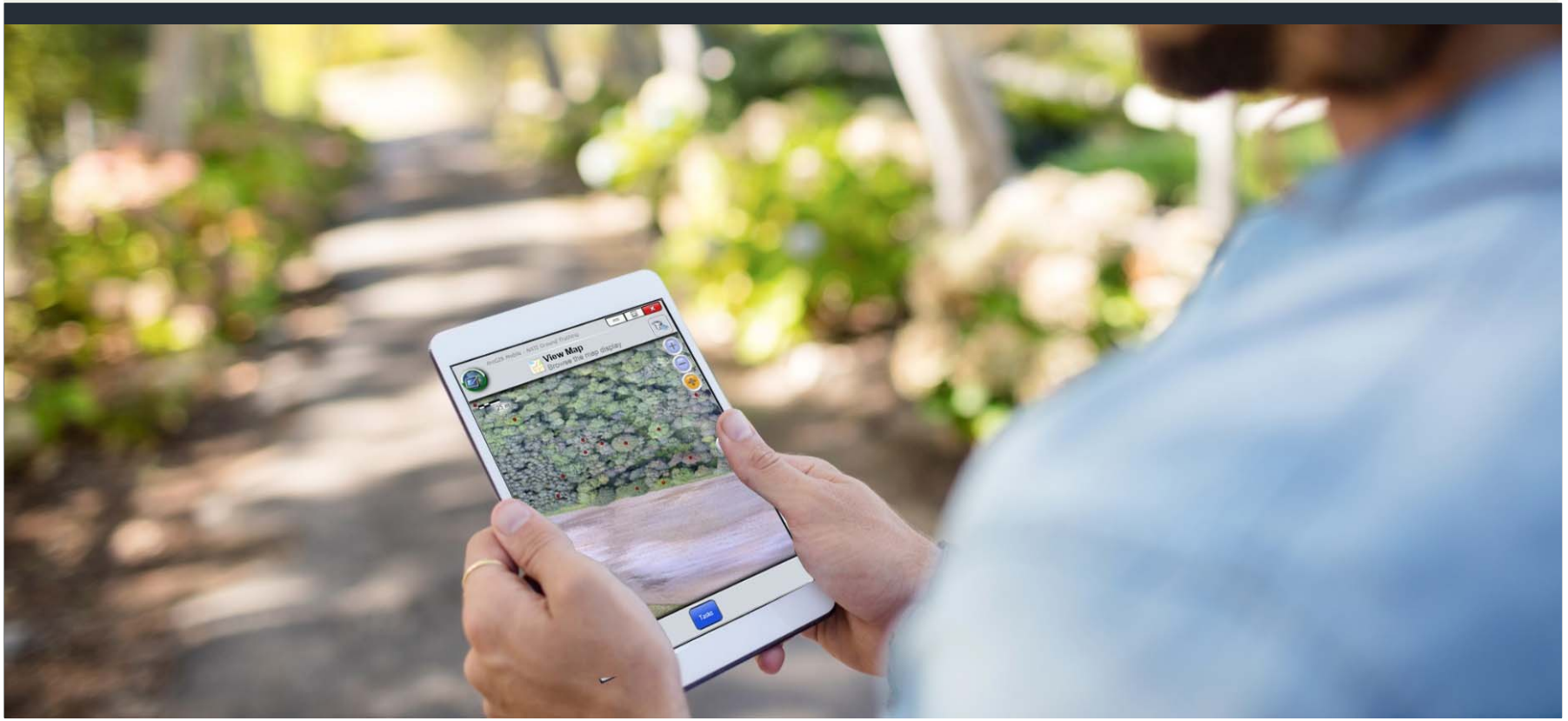
UAV Image | Species Classification | Tree Health | Target Map



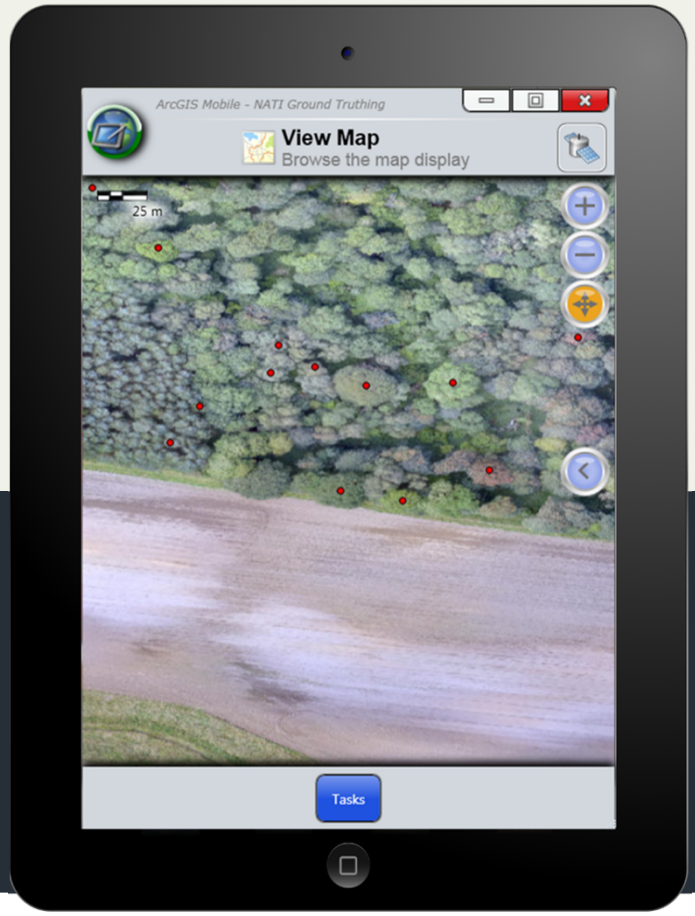


Individual tree species identification also provides a tree count

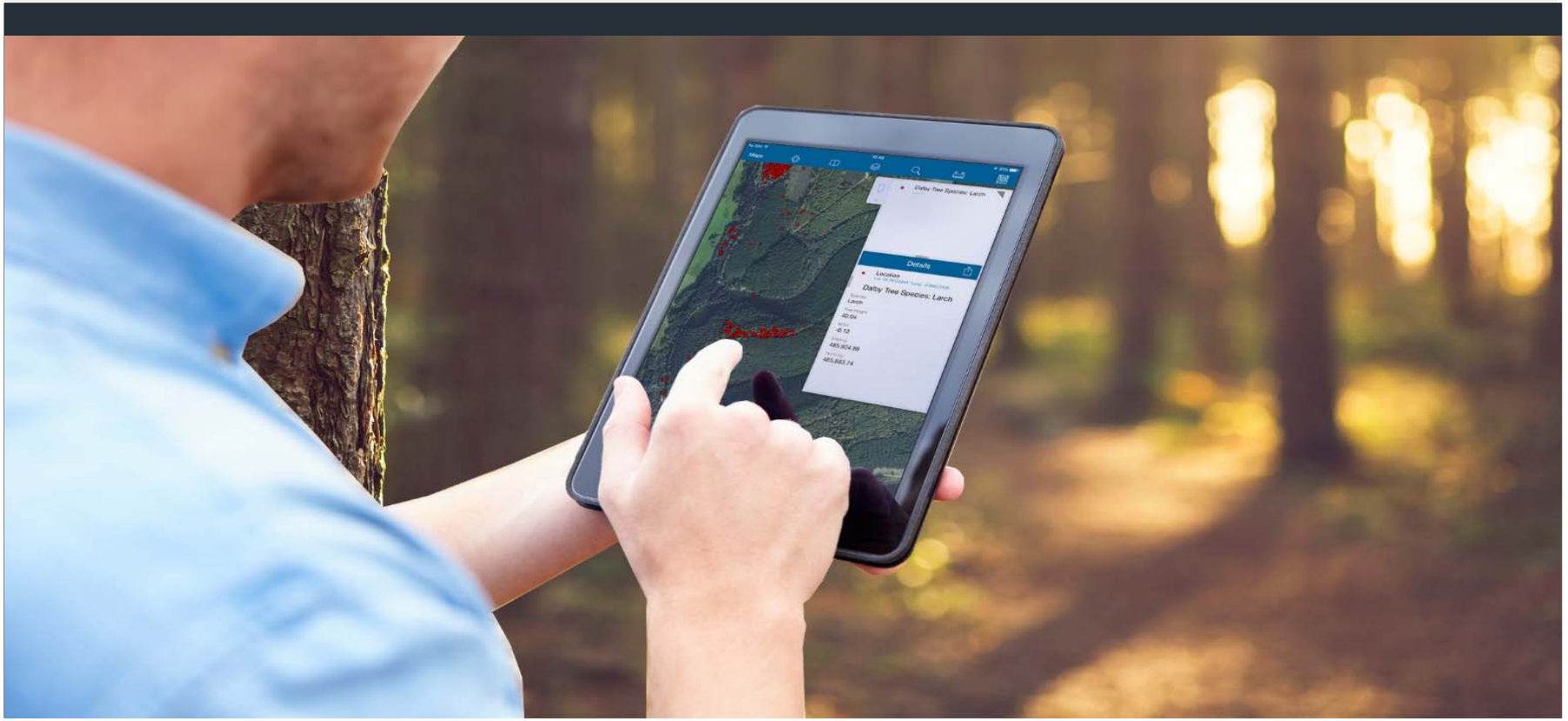
Mobile GIS – Ground Truth Data



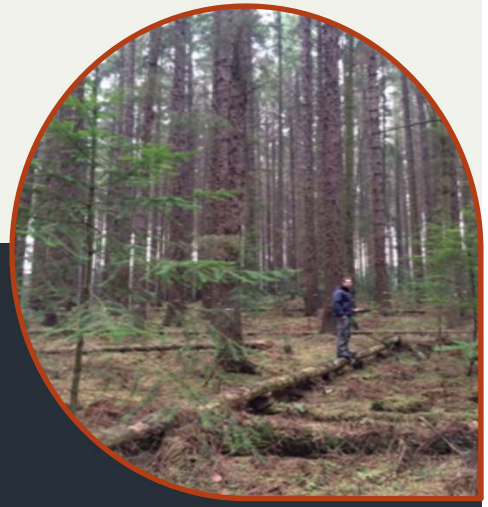
Mobile GIS – Ground Truth Data



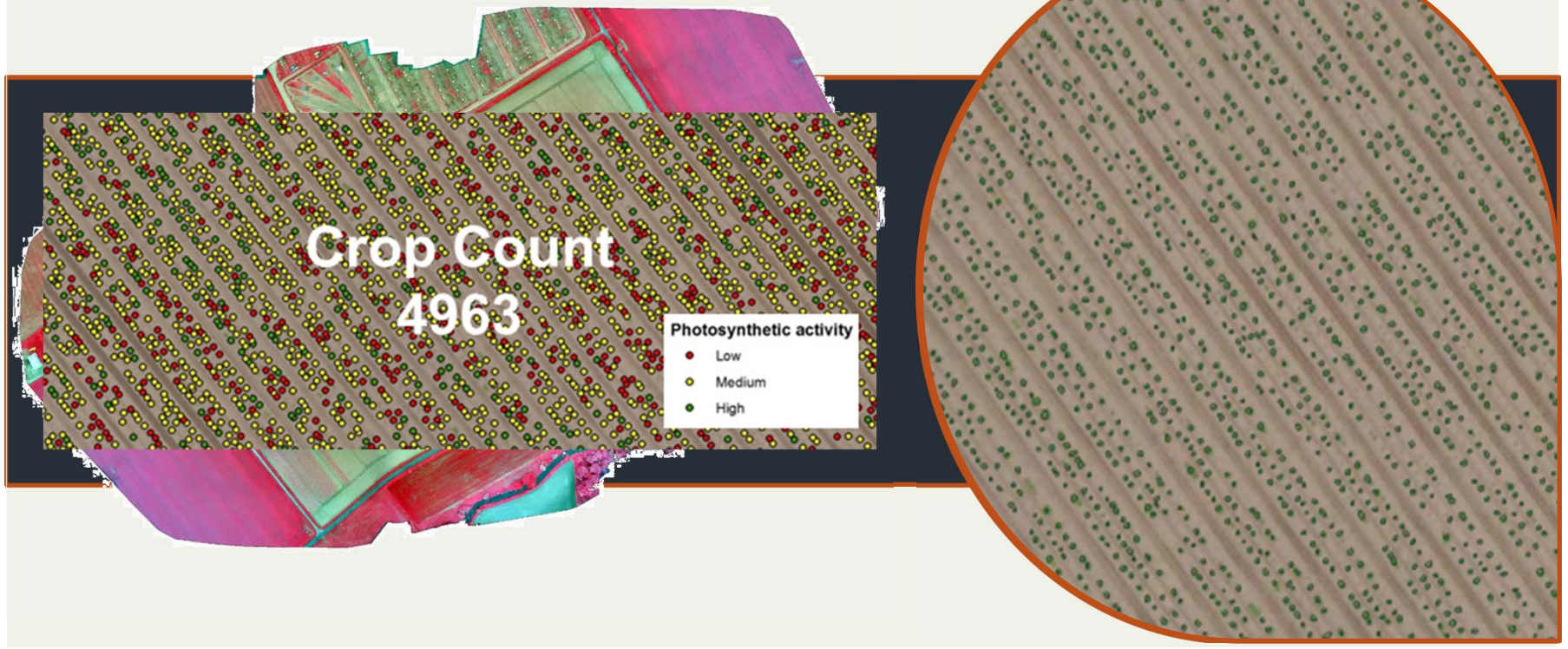
Mobile GIS – Host Species Inspections



Mobile GIS – Host Species Inspections

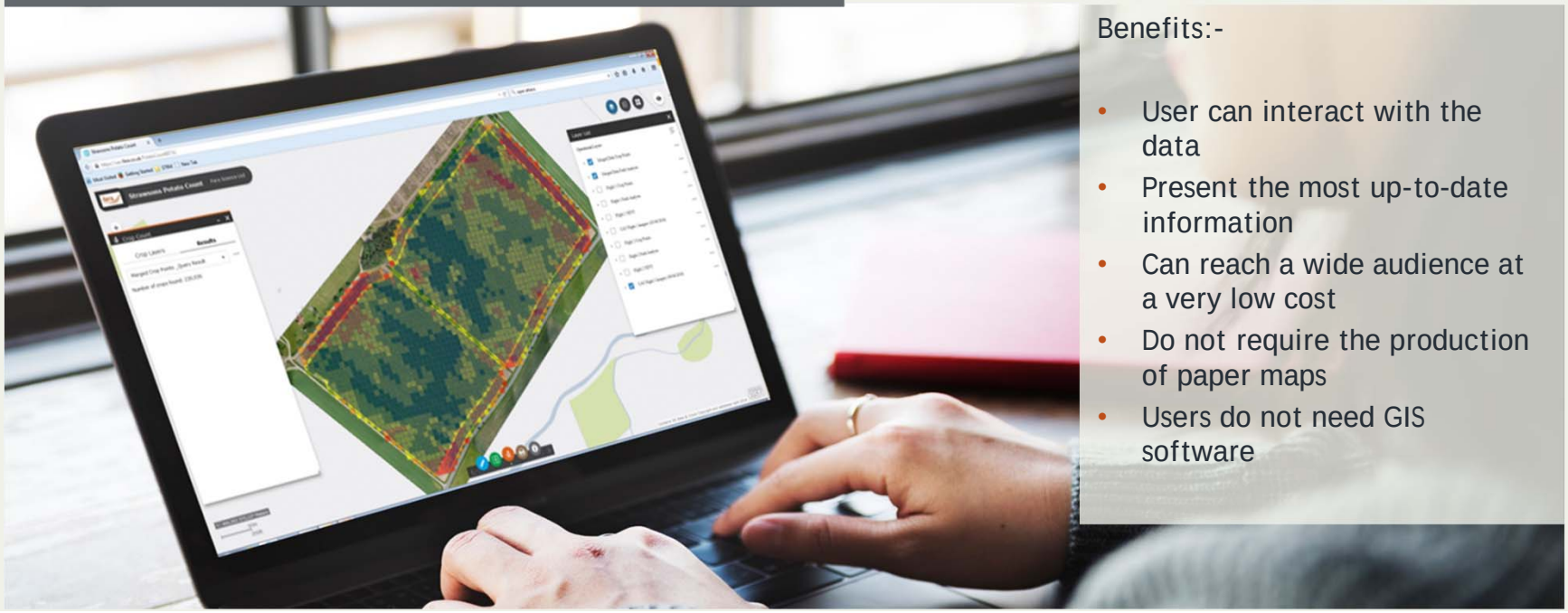


UAV Case Study – Automatic Crop Counts



Data Dissemination - web mapping

- An online map that allow users to view, interrogate, and analyse geographic data
- Shared over the internet and can be accessed via a web browser on a PC, a smartphone and/or a tablet



Benefits:-

- User can interact with the data
- Present the most up-to-date information
- Can reach a wide audience at a very low cost
- Do not require the production of paper maps
- Users do not need GIS software

CLASP Project Introduction

- Funded by STFC Challenge Led Applied Systems Programme (CLASP)
- The Challenge
  - Understanding tree species distribution/health of woodlands: fundamental to disease and pest control
  - Species maps for local scale management.
- Project Aim
  - Develop an approach to tree species mapping over large areas – to be tested on single local authority area
  - Fusion of technology and knowledge

Technologies Involved

Technology Readiness Levels (TRL)

TRL9 **Operations**

TRL8 **Active Commissioning**

TRL7 **Inactive Commissioning**

TRL6 **Large Scale**

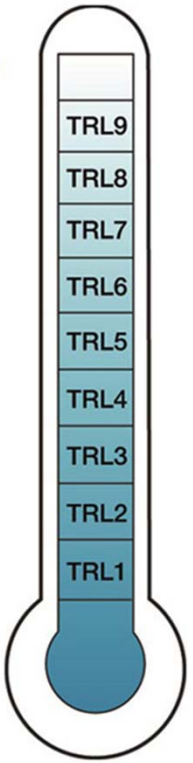
TRL5 **Pilot Scale**

TRL4 **Bench Scale Research**

TRL3 **Proof of Concept**

TRL2 **Invention and Research**

TRL1 **Basic principles**

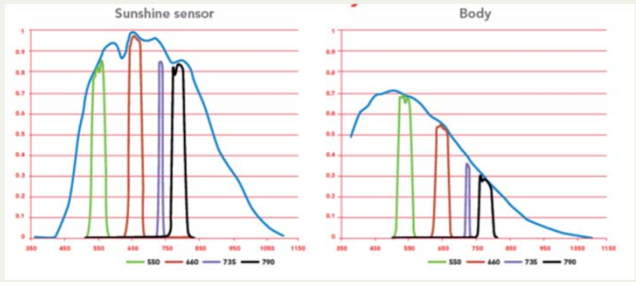


Sensors and Platforms

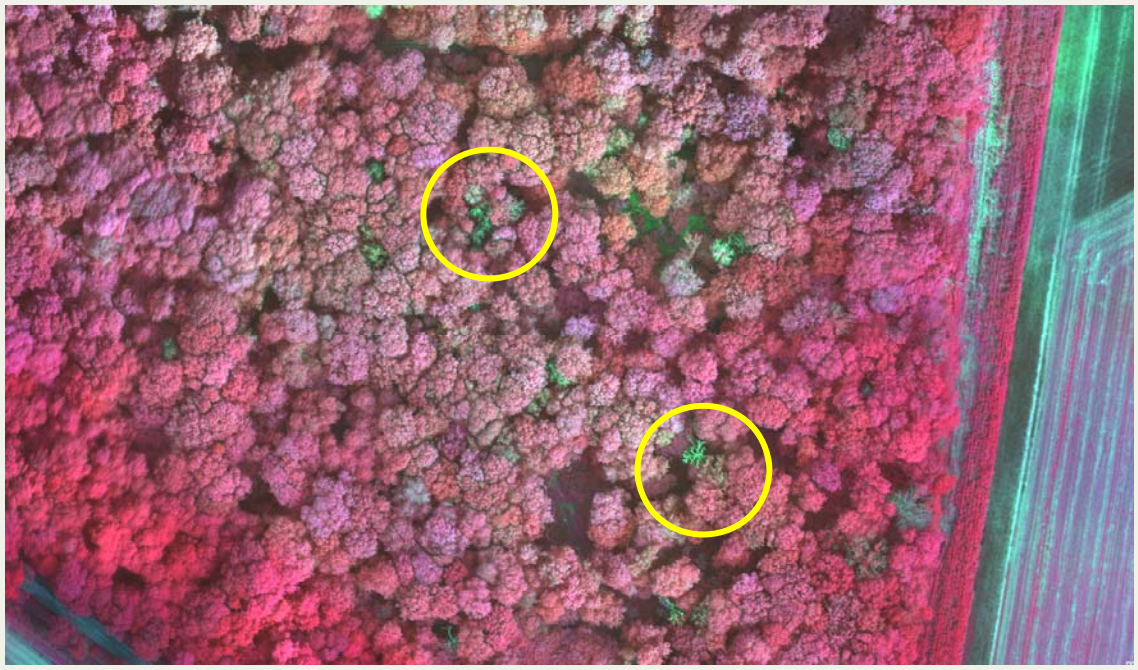
- EO Satellite (TRL=9)
  - Large spatial coverage
  - Low resolution
  - Sensors fixed but high quality

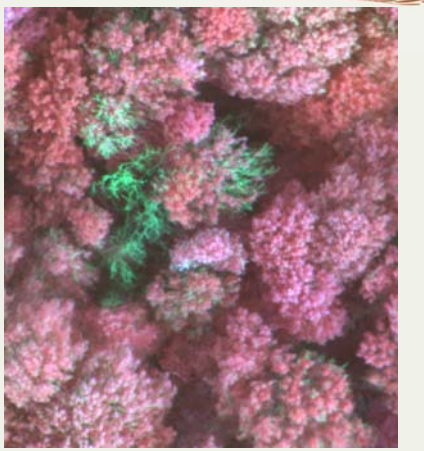
- UAV (TRL=9)
  - Small spatial coverage
  - High resolution
  - New sensors easily integrated
  - Flight restrictions
  - Privacy and data protection concerns

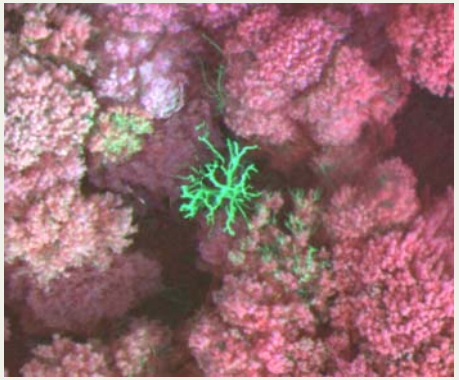
- Multispectral Sensors (TRL=9)



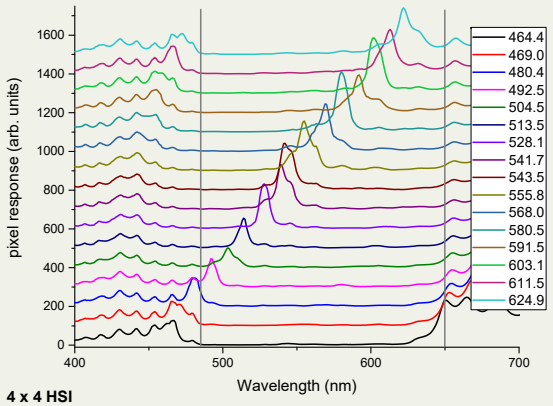
Multispectral Imagery



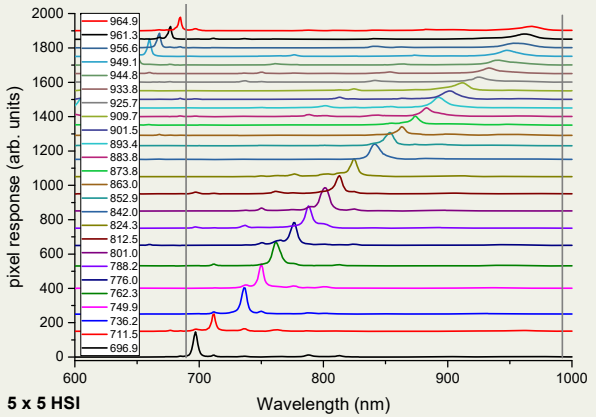




Hyperspectral Sensors (TRL = 2-5)



4 x 4 HSI



5 x 5 HSI

DJI MATRICE 600 PRO

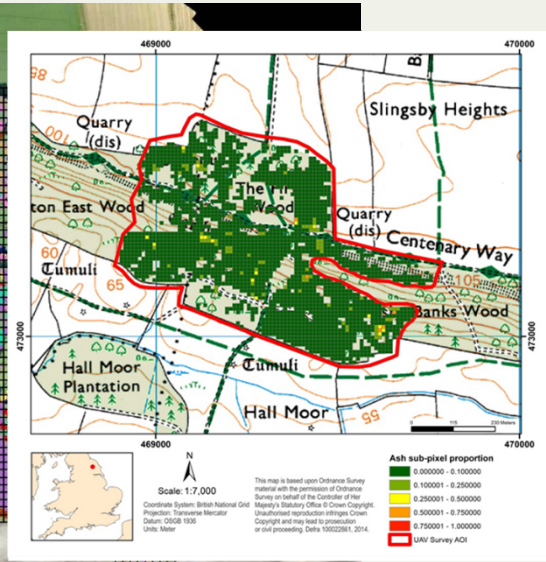
- 5.5 kg Max Payload
- 65 kph Max Speed
- 16-18 minute Flight Time

Future……Data Fusion

UAVs training Sentinel-2

Ash

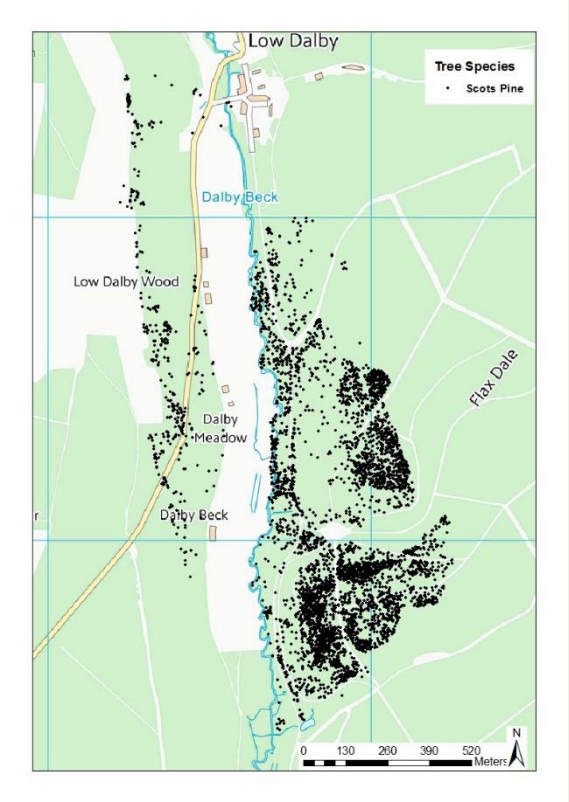
Proportion from UAV Data

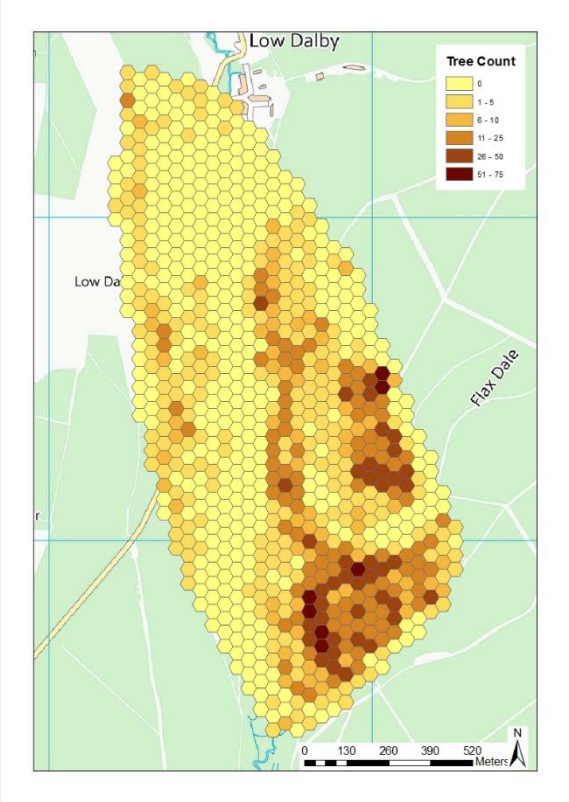


Random Forest Prediction

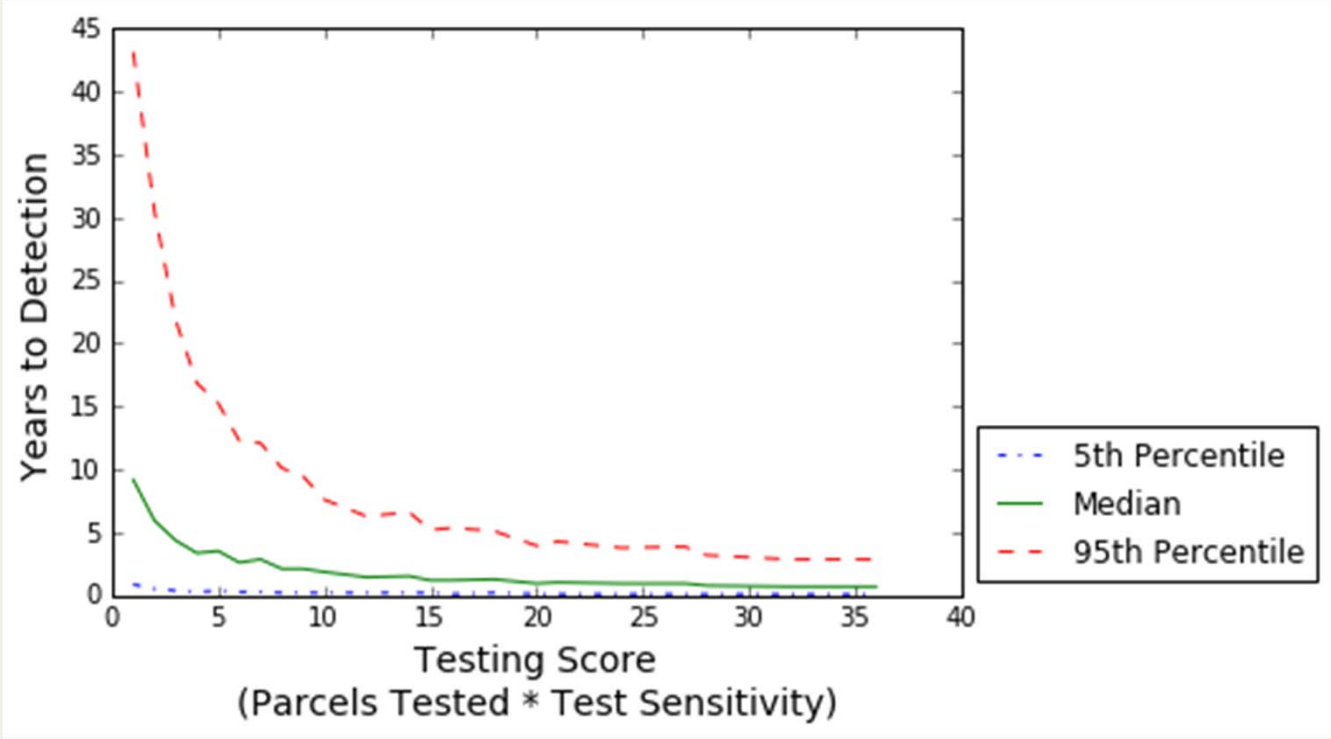
Using RS information in modelling outbreaks

Model Scenario – Dothestroma Like Pathogen





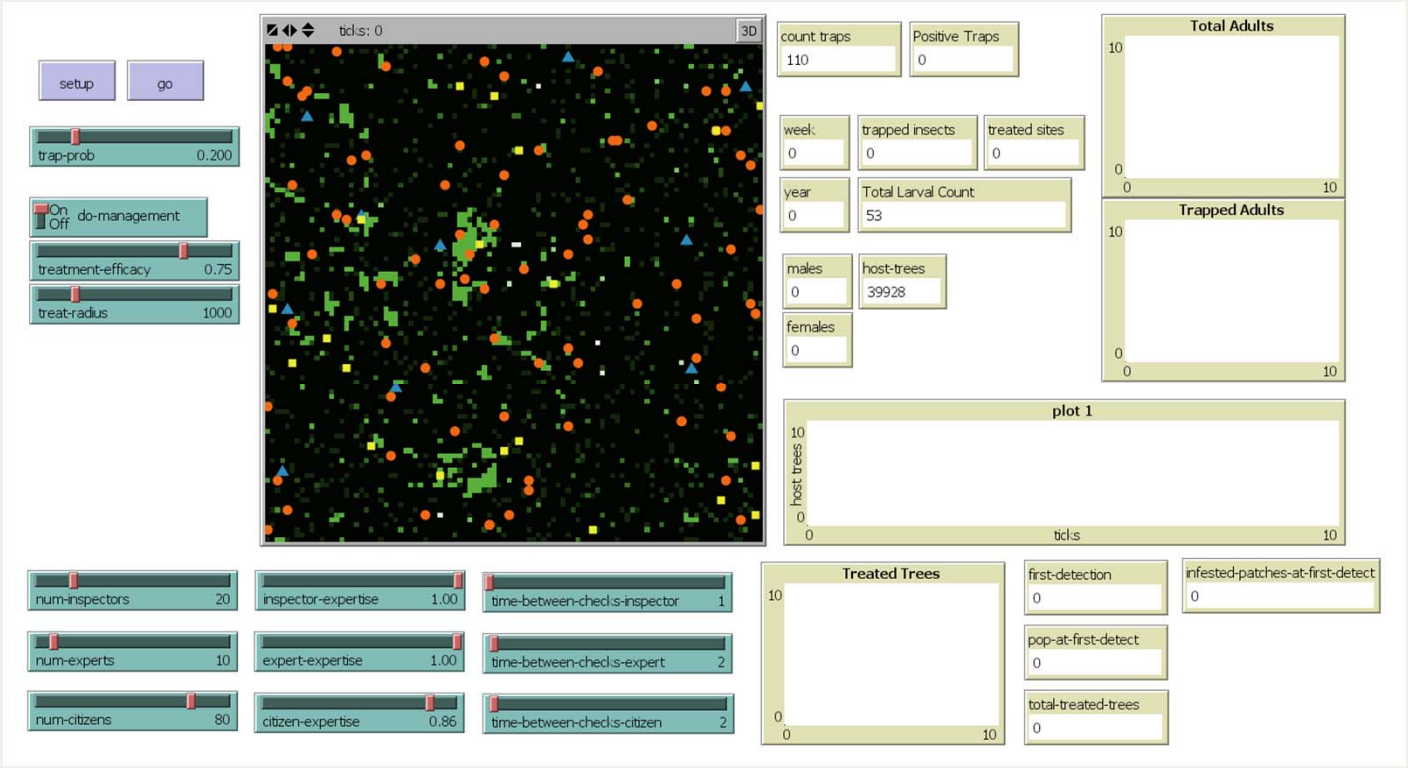
Modelling Time to Detection



Model Scenario – EAB Outbreak

- 10km square centred on Drax power station
- Woodland: 116 ash trees per ha
- Wider landscape: Randomly distributed 10-18 ash trees per sq. km
- Outbreak starts with 1 female Emerald Ash Borer
- Outbreak simulated over 25 years
- 3 Trap Operator classes
  - Inspector
  - Expert
  - Citizen Scientist
- Parameters
  - Trapping probability
  - Treatment efficacy
  - Treatment radius
  - Number of operators
  - Operator expertise
  - Time between checks

EAB - Agent Based Model



Cost-Benefit Modelling