

PROVIDING DEFRA WITH ACCESS TO UNIQUE SATELLITE-DERIVED FORESTRY INTELLIGENCE

THE PROBLEM

An outbreak of sweet chestnut blight, a plant disease caused by the fungus *Cryphonectria parasitica*, has recently been discovered in the South West of England.

To support Defra in managing the outbreak and to explore how Earth Observation data could be deployed in outbreak situations, Rezatec was invited to develop an interactive map capable of locating Sweet Chestnut trees in the outbreak area and identifying stressed trees.

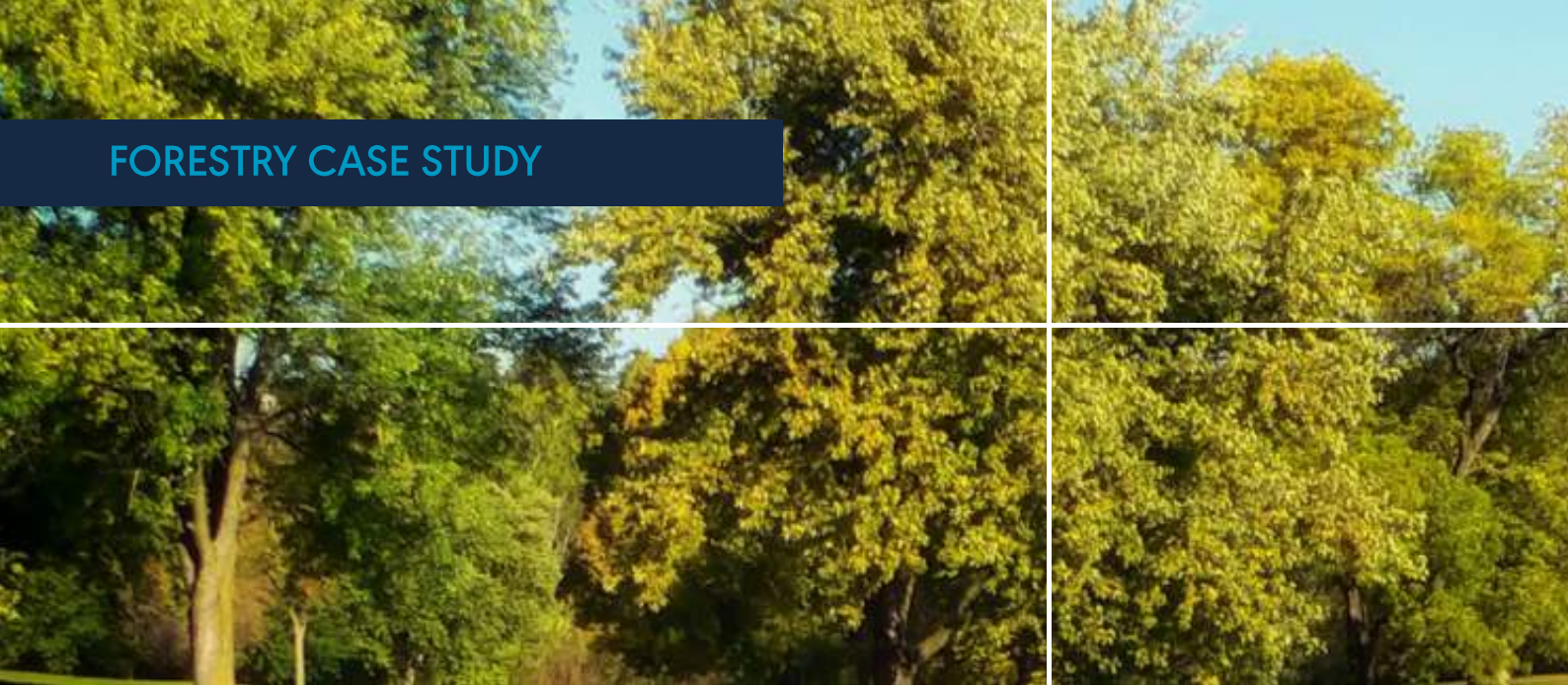
This map could potentially be used to inform the deployment of ground-team resources to assess the extent of the outbreak and potential mitigation measures.

"The interface is easy to use and provides useful information on the fine scale distribution of Sweet Chestnut and Oak that would not be available without Earth Observation technology." Defra, Plant Health Team



Rezatec





THE SOLUTION

Rezatec provided Defra with access to unique, satellite-derived data products that allowed them to:

Identify tree locations: The map provided Sweet Chestnut and Oak trees layers on top of satellite imagery

Detect change: Earth Observation data was used to identify stressed Sweet Chestnut. Although tree stress could be caused by a large number of factors, analyses like these could be used to prioritise areas for ground inspections to determine the presence of pests & diseases.

+ Species Identification

Rezatec's tree species classification data product was used to model the presence of both Sweet Chestnut or Oak trees, based on the unique spectral signature of these target species within the input Earth Observation datasets. Data collected between Summer 2016 and Winter 2016 was used for this analysis.

Each pixel on the map provided an estimate of the likelihood of Sweet Chestnut or Oak trees being present which was used to assess species distribution and relative spatial abundance. Pixels where one of these tree species was modelled as being the dominant species was classed as being that species (see Fig.1). The results were made available to Defra using Rezatec's interactive web GIS Portal.



FIG 1: Extract from Rezatec's interactive web GIS Portal depicting the entire area of interest in the study for species identification of Sweet Chestnut (SC) and Oak (OK).



+ Change Detection

Rezatec's forestry change detection data product was adopted to measure any anomalous phenological behaviour in the Sweet Chestnut presence map output. Specifically, annual time-series were analysed for all of the Sweet Chestnut pixels in the study area, to identify significant deviations (temporal and spatial) in phenological behaviour, assumed to be an indicator of canopy stress. The analysis for the detection of temporal anomalous behaviour was conducted on imagery collected between 2015 and 2016.

As before, the results have been made available within the Rezatec interactive web GIS Portal. The colour of each pixel on the map layer indicates severity of the deviation in 2016 from an established baseline for the mapped Sweet Chestnut pixels (see Fig.2).

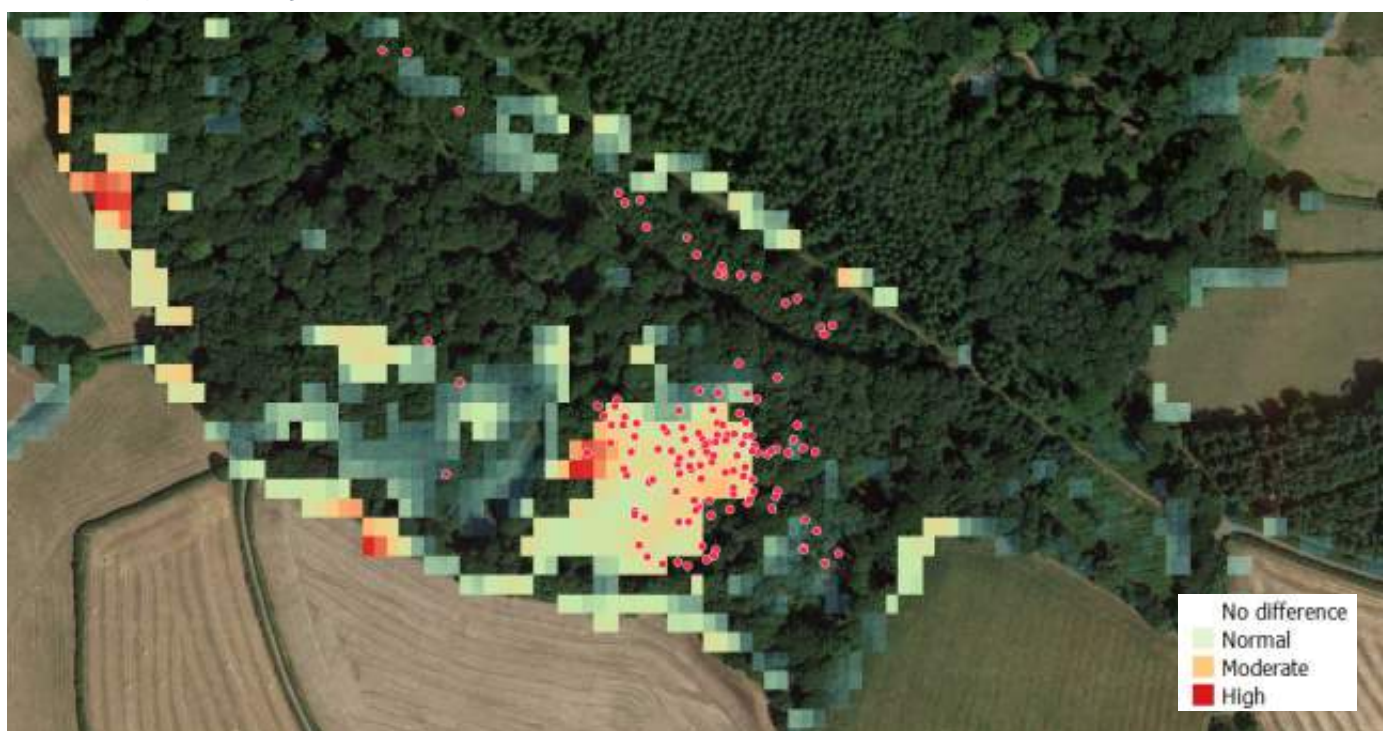


FIG 2: Extract from Rezatec's interactive web GIS Portal depicting a small section of the results in the study for evidence of Sweet Chestnut stress.

THE OUTCOME

With an easy-to-use interface and visualised geospatial data layers, Rezatec's web portal provides an opportunity for Defra to analyse and interrogate the information and make informed decisions based on up-to-date geo-spatial data. This is a powerful outcome supporting Defra's challenge to understand and manage this outbreak as well as potential future ones.

Defra can now:

- + Understand the fine scale distribution of Sweet Chestnut and Oak trees in a target area
- + Detect signs of tree stress, a potential indicator of tree health issues caused by pests and diseases
- + Monitor for early-warning signals of plant pest spread
- + Explore how Earth Observations can be used to inform tactical responses, e.g. by ground truthing data developing time-series in areas of interest

The data product layers that enable these new capabilities include:

- + Spatial distribution and extent of target tree species (Sweet Chestnut and Oak)
- + Analysis of tree health, with a graded indication of stress levels

"Rezatec has successfully worked with Defra's Plant Health team to generate a better understanding of how Earth Observation technology can be used to address the challenges posed by tree pests and diseases. Their ability to map a range of tree species (incl. Ash, Oak and Sweet Chestnut) at remarkably high-levels of accuracy has supported our response to outbreaks and could potentially revolutionise Defra's response to quarantine pests and diseases in the wider environment."

Willem Roelofs, Plant Health Evidence Team, Defra - 28/07/2017

"We are very pleased to support Defra in its mission to understand the development of this tree pathogen problem, and hope that it also helps the future ability to detect, treat and prevent the spread in monitored forested areas. Rezatec's suite of products within Forestry allows for comprehensive monitoring and mensuration so it is really exciting to be involved at Government level in the identification and safeguarding of the UK's trees and forests. We should also mention that it would not have been possible to get to this point so quickly without the initial support Rezatec received from the UK Space Agency's 'Space for Smarter Government' Program (SSGP) and the collaborative working with Forest Research. The funding has resulted in end user product that is now commercially available." Tim Vallings, VP Global Resources, Rezatec