

PROVIDING DEFRA WITH ACCESS TO UNIQUE SATELLITE-DERIVED FORESTRY INTELLIGENCE

THE PROBLEM

In the South West of England, there has been a Sweet Chestnut blight (*Cryphonectria parasitica*) outbreak and it is not known how long it has been in existence.

DEFRA has some known locations of Sweet Chestnut within this area, measured before and after late December 2016. A decision was taken to investigate the use of Earth Observation data from Rezatec to help understand the development of the outbreak in order to efficiently deploy ground-team resources for remedial activity.

"The interface is nice and easy to use for visualisation purposes... a very useful understanding of the fine scale distribution of Sweet Chestnut."

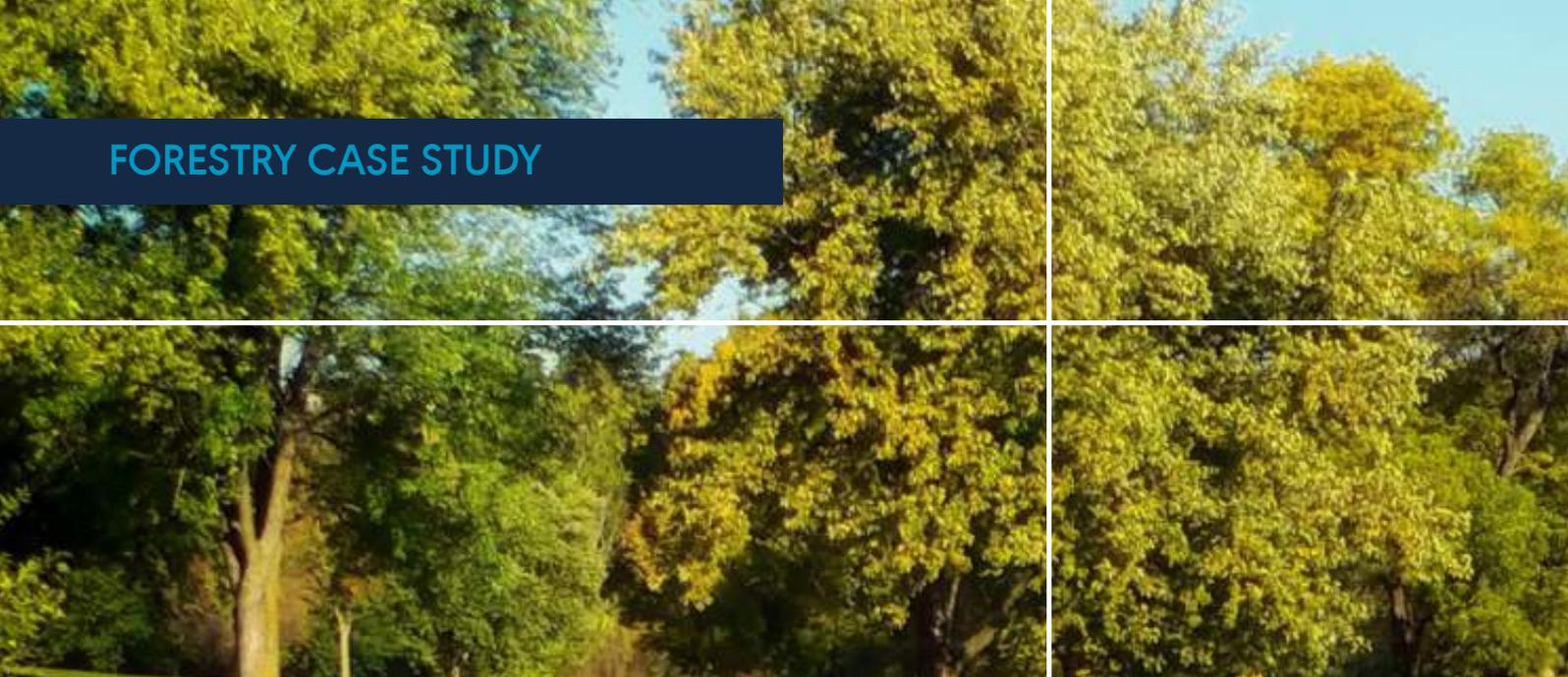
Willem Roelofs, Plant Health Research Strategy / Joint Head of Profession for Operational Research, DEFRA



Rezatec



Department
for Environment
Food & Rural Affairs



THE SOLUTION

Covering an agreed Area of Interest, Rezatec provided DEFRA with access to unique, satellite-derived data products, including:

Species Identification: Specifically looking at Sweet Chestnut and Oak trees

Change Detection: Assessing for stressed Sweet Chestnut trees using Earth Observation data covering the assigned area over a time series of captured data

+ 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. The image time-period for the tree species analysis was between Summer 2016 and Winter 2016.

As an output, each pixel provided a predicted dominance of either Sweet Chestnut or Oak trees present within a pixel, in order to assess species distribution and relative spatial abundance. Any pixel where one of these tree species was modelled as being the dominant species, was then classed as being that species (see Fig.1). The results have been made available to DEFRA within the Rezatec interactive web GIS Portal.

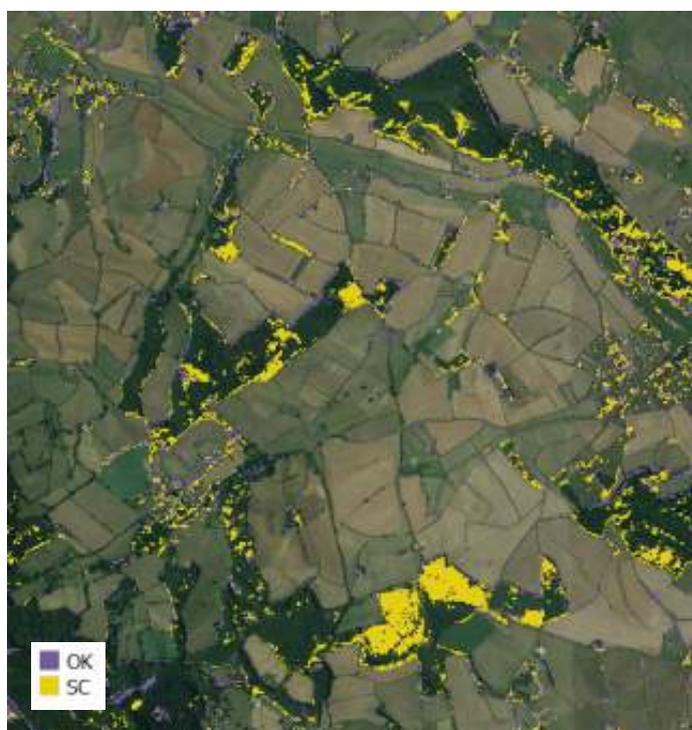


FIG 1: Extract from Rezatec's interactive web GIS Portal depicting the entire area of interest in the study for species identification of Sweet Chestnut (SC) and Oak (OK).

+ 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 was analysed for all of the Sweet Chestnut pixels in the study area, to identify significant deviations (temporal and spatial) in phenological behaviour, which is indicative of canopy stress. The analysis for the detection of temporal anomalous behaviour was conducted on imagery between 2015 and 2016.

As an output, each pixel shows the 2016 deviations from the established baseline for the mapped Sweet Chestnut pixels, styled to show severity of deviation (see Fig.2). The results have also been made available within the Rezatec interactive web GIS Portal.

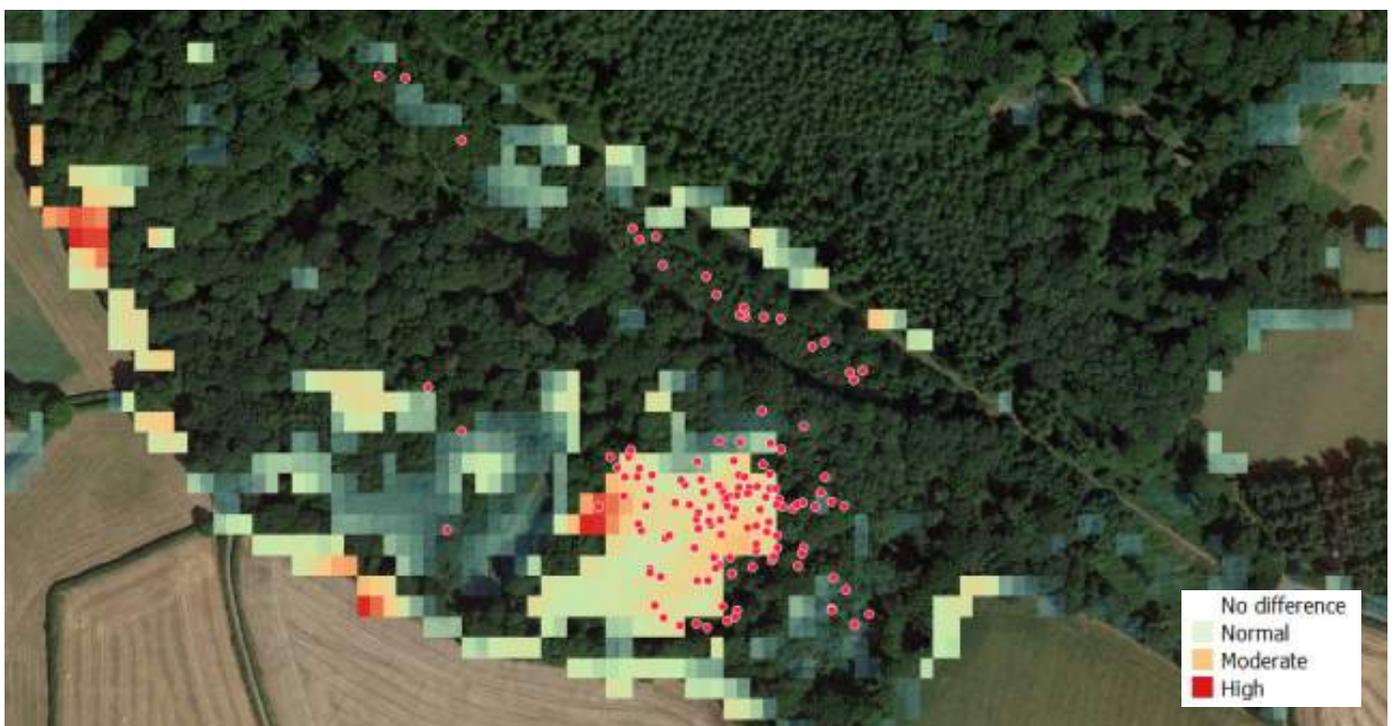


FIG 2: Extract from Rezatec's interactive web GIS Portal depicting a small section of the results in the study for evidence of Sweet Chestnut stress.

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 intelligent decisions based on real data. This is a powerful outcome supporting DEFRA's challenge to understand and manage this outbreak as well as similar future occurrences.

DEFRA can now:

- + Understand the fine scale distribution of Sweet Chestnut and Oak trees in a target area
- + Detect any anomalous signs of tree stress and health issues
- + Monitor for early-warning signals of plant disease spread
- + Integrate ground truthing data and an extended time-series of data for a complete picture

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 and where it is present

"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 Research Strategy / Joint Head of Profession for Operational Research, DEFRA - 28/07/2017

"We are very pleased to support DEFRA in their 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."

Tim Vallings, VP Global Resources, Rezatec