UNIQUE SATELLITE-DERIVED FORESTRY INSIGHT FOR DEFRA

To support Defra in managing an outbreak of Sweet Chestnut blight, Rezatec was invited to develop an interactive map capable of identifying species and stress using Earth Observation.

The challenge

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. The client for this project - Defra, the UK Government's Department for Environment, Food & Rural Affairs - is managing the outbreak and wanted 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 aid the deployment of ground-team resources to assess the extent of the outbreak and potential mitigation measures.

The space based solution

Rezatec provided Defra with access to unique, satellite data products derived from Sentinel 1 and 2 satellites that allowed them to...

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

Detect change: Copernicus Earth Observation data was used to identify stressed Sweet Chestnut. Although tree stress can 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. 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 detected pixels in the study area, to identify significant deviations (temporal and spatial) in phenological behaviour, assumed to be an indicator of canopy stress.

Benefits to Citizens

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.

Extract from Rezatec's interactive web GIS Portal depicting the entire area of interest in the study for species identification of Sweet Chestnut and Oak derived from Sentinel data.

Thematic Area: AGRICULTURE, FOOD, FORESTRY AND FISHERIES

Region of Application: DEVON

Sentinel mission used: S1, S2

Copernicus Service used: –

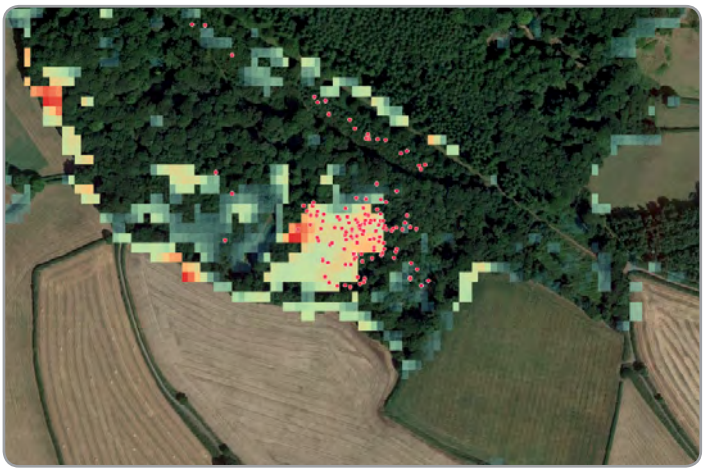
Usage Maturity Level: 5

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 signs 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
- Analysis of tree health, with a graded indication of stress levels.



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

> "Their ability to map a range of tree species 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 Team, Defra

Outlook to the future

Rezatec are very pleased to support Defra in its mission to understand the development of this tree pathogen problem, and the hope is that it will also help their future ability to detect, treat and prevent the spread of pathogens in monitored forested areas.

Rezatec's suite of products within the Forestry industry allows for comprehensive monitoring and mensuration so this is a really exciting time to be involved at Government level in the identification and safeguarding of the UK's trees and forests.

Acknowledgements

Rezatec would like to mention that it would not have been possible to get to this point so quickly without the initial support it received from the UK Space Agency's 'Space for Smarter Government' Programme (SSGP) and the collaborative working with Forest Research. The funding has resulted in an end-user product that is now commercially available.

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ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication "**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**", 2018, Edited by NEREUS, the European Space Agency and the European Commission.
The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains.
The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.
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