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+ **STOPPING BEETLE DEVASTATION IN THE FORESTS OF THE CZECH REPUBLIC:**

How FMI leveraged Planet imagery to locate 16,000 hectares of timber damage and inform forest policy change
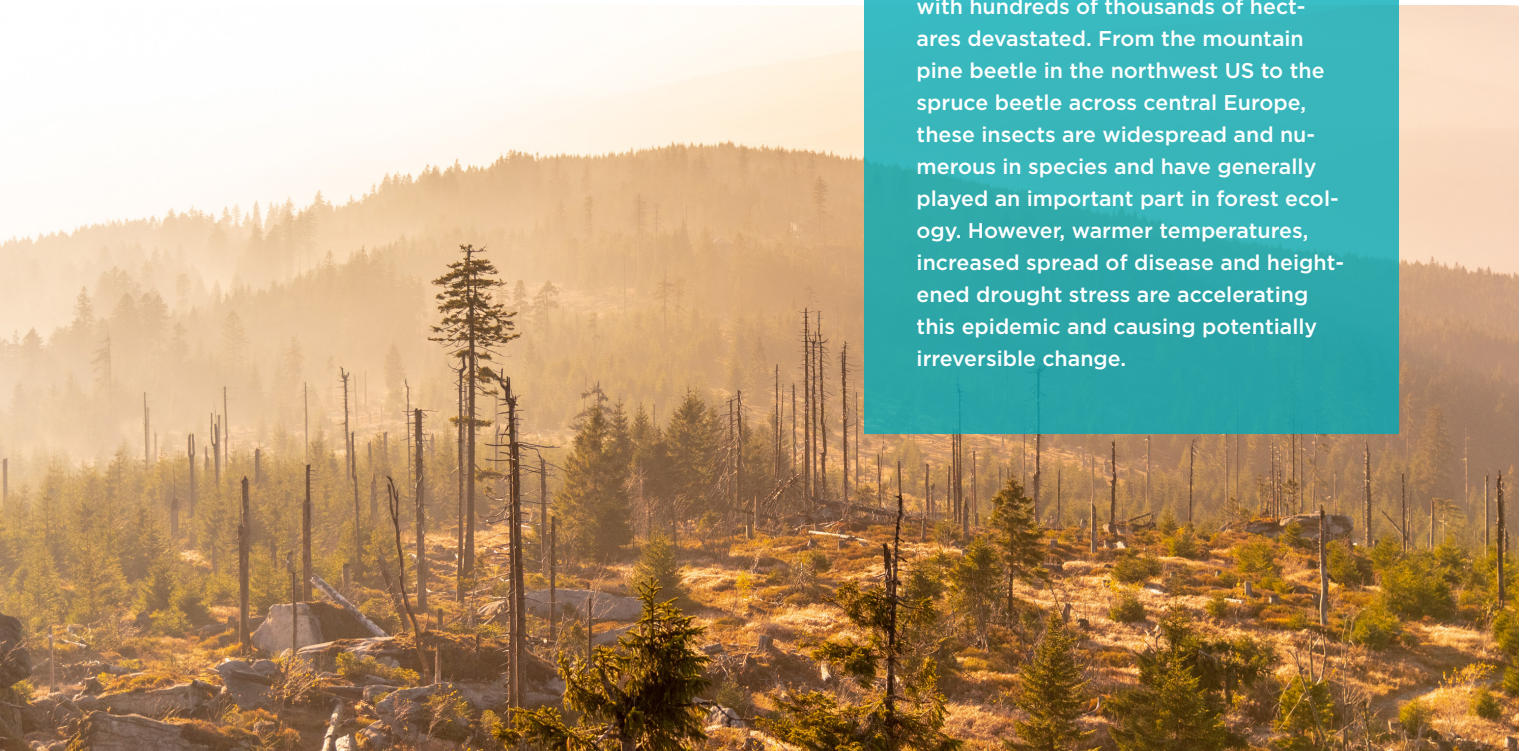
FOREST MANAGEMENT INSTITUTE, CZECH REPUBLIC

Assessing EUR200m of timber damage from the 2018 bark beetle outbreak

Using PlanetScope as their primary dataset, FMI undertook a comprehensive geospatial analysis and created a national, public portal for forest stakeholders to assess and respond to the current bark beetle epidemic.

THE SPREAD OF BARK BEETLE

Forests across Europe and North America have recently been ravaged by unprecedented bark beetle outbreaks, with hundreds of thousands of hectares devastated. From the mountain pine beetle in the northwest US to the spruce beetle across central Europe, these insects are widespread and numerous in species and have generally played an important part in forest ecology. However, warmer temperatures, increased spread of disease and heightened drought stress are accelerating this epidemic and causing potentially irreversible change.

Forest devastated by bark beetle infestation. Sumava National Park and Bavarian Forest, Czech republic and Germany.

The Forest Management Institute

The Forest Management Institute in the Czech Republic is a governmental organization, responsible for collecting and centralizing national forest data over 70,000km^2, such as forest inventories. FMI's Remote Sensing department is well established and supports FMI's mandate by leveraging aerial and satellite imagery.

The Challenge

FMI needed to identify, survey and report all beetle-devastated areas nationwide. This assessment was necessary for the government to understand the full scope of the issue, to mitigate further risk to valuable timber and deploy resources more efficiently. A lack of recent data, at the right resolution, on such a broad scale, previously made this task very challenging. FMI's surveys accounted for two types of events: sanitary logging (trees already cut down due to beetle-induced mortality) and dead forest stand (dead, infested trees that need to be removed to mitigate spread of disease).

ADVANTAGES OF PLANET'S DATA

FMI chose PlanetScope imagery, as it was uniquely positioned to help combat this problem by coupling high temporal cadence and spatial resolution.

CADENCE Daily imaging increases the likelihood of capturing cloud-free pixels across the Czech Republic, enabling a higher quality, complete coverage, cloud-free monthly mosaic. Traditional satellite alternatives lack this coverage and consequently capture fewer cloud-free pixels during the cloudy, rainy season.
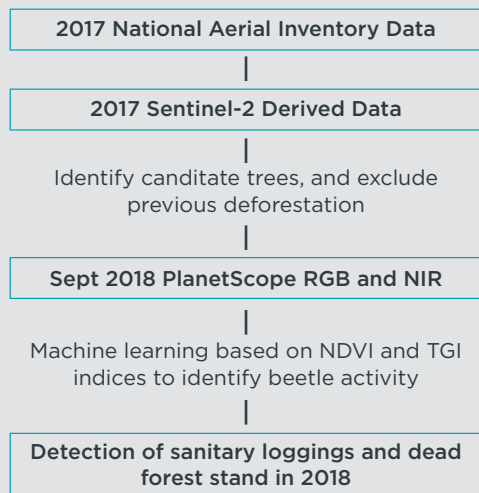
RESOLUTION PlanetScope resolution allows FMI to work on a forest-stand / near individual tree level across a broad area, which is particularly relevant for early detection of pests as outbreaks are initially localized before they spread.


Czech Republic

Recent Forest Removal
Attributed to Bark Beetle Activity

True Color

NDVI

Dead Standing Wood

Zlín Region
Czech Republic
49°23'10.6"N, 17°44'00.9"E

Normalized Difference Vegetation Index (NDVI)

0   0.2   0.4   0.6   0.8   1

SOLUTION

FMI leveraged multiple data sources to conduct their analysis. Data derived from Sentinel-2 (tree species layer) and the Czech national aerial inventory (tree height) were used to identify candidate tree areas, which were mostly mature Norway Spruce trees and to exclude deforestation from previous years. FMI combined this dataset with a countrywide mosaic created from Planet's RGB and NIR imagery, to conduct vegetation analyses and ultimately identify dead forest stand and sanitary logging.

2017 National Aerial Inventory Data

2017 Sentinel-2 Derived Data

Identify canditate trees, and exclude previous deforestation

Sept 2018 PlanetScope RGB and NIR

Machine learning based on NDVI and TGI indices to identify beetle activity

Detection of sanitary loggings and dead forest stand in 2018

> **"There is no other comparable commercial system offering the combination of sensing large areas in high spatial and temporal resolution."**
>
> PETR LUKEŠ, Remote Sensing Scientist at FMI
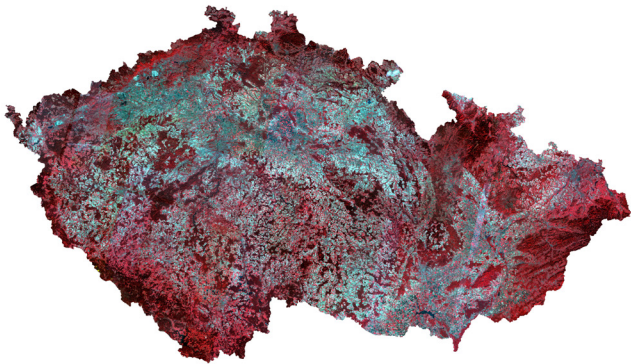
RGB-NIR mosaic in 2018

RESULT

FMI has had a number of important outcomes as a result of this analysis:

ECONOMIC IMPACT:
FMI were able to determine that EUR 200 million worth of timber (~16,000 hectares) was impacted.

LEGISLATION:
The Ministry of Agriculture is proposing new legislation to re-zone forests to minimize the spread of the disease and optimize timber harvesting. In the current system, this is a complex task given forest ownership, disaggregated forest areas and existing commercial permits.

ACCESSIBILITY
Forest owners can easily and quickly access a publicly available map to assess their forests, quickly identify trees that may need to be removed and optimize their resources for harvesting.

FMI were also able to validate some of their findings based on Planet data.

- Over 90% of 55 randomly selected plots were confirmed to be at risk areas of further disease spreading. In fact, almost 20% of this impact was unknown by the forest owner.

- The Czech Forest Commission, which owns over 50% of forests in the country, have since confirmed the map is ~85% accurate.

FMI expects to see more users and a broader impact as this work continues into 2019.

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