

Detecting Reforestation from Space

Pixel-level early detection of restoration activity applied to Saarland's storm ,and beetle damaged forests

10

The problem

Forests are cleared by natural and human induced disturbances



Natural Disaster



Cleared forest

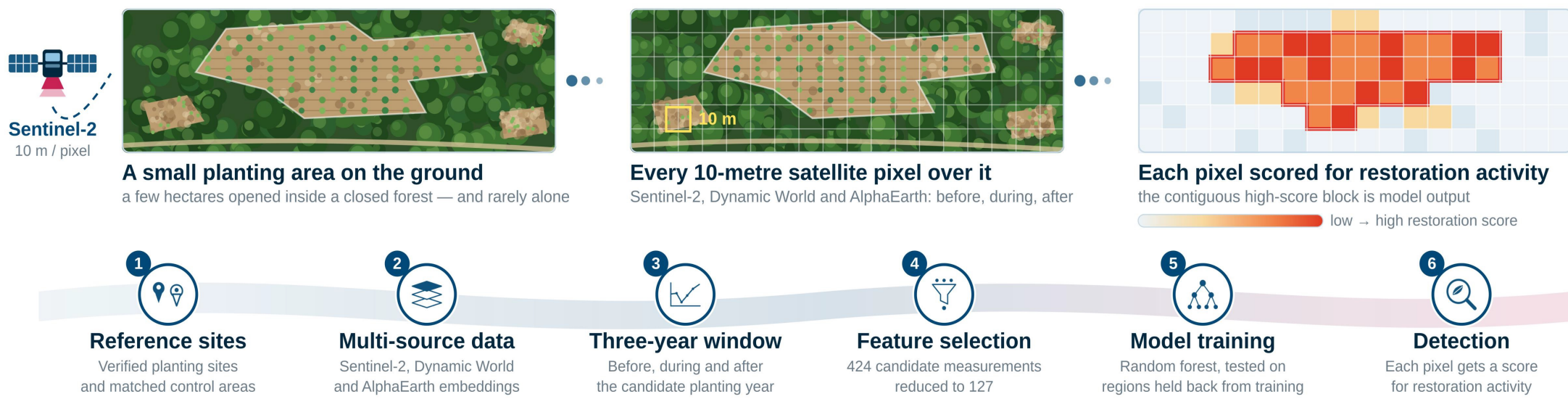


Intervention

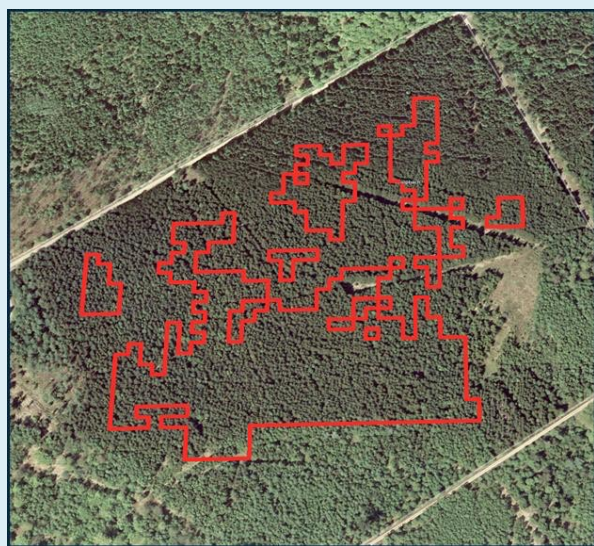


With thousands of reforestation sites resulting from this ,and spread across the globe ,can we tell where reforestation is happening or where tree planting related disturbance has occurred using satellite data

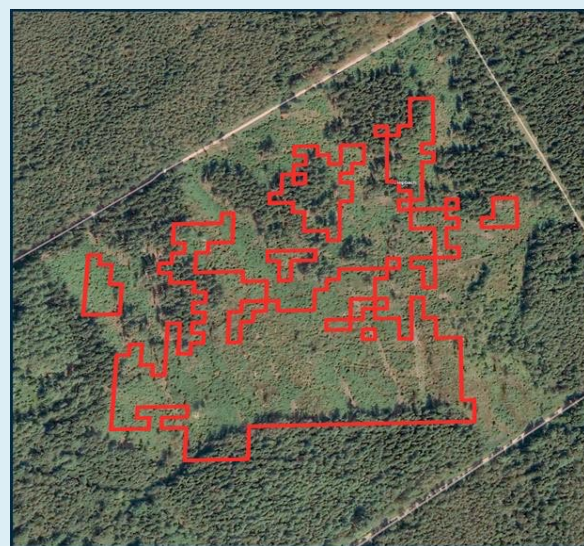
How it works



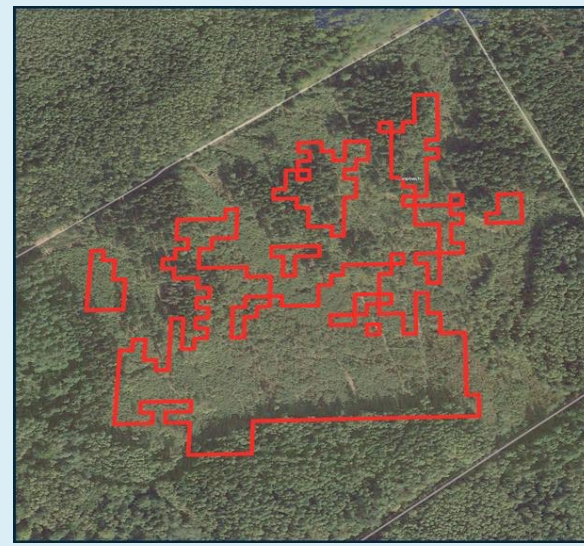
Saarland application: a reforestation site near Krippbach, 2018–2024



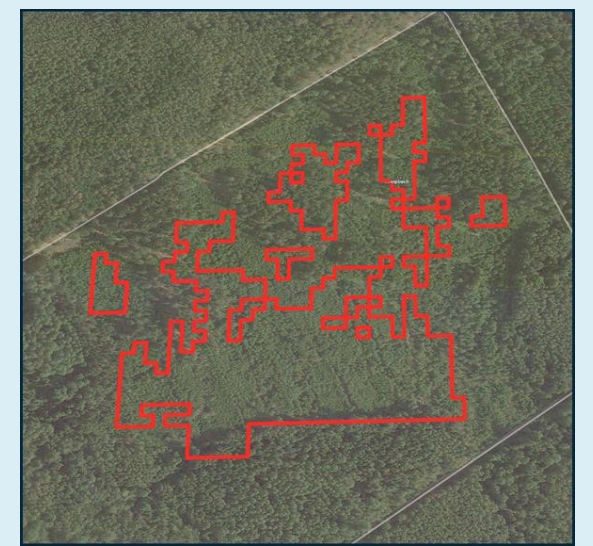
2018



2019



2020



2024

What this means for Saarland

A replanted area can be picked out from orbit about a year after planting, instead of waiting for a canopy to form. Sites across the state could be screened continuously and at no field cost, the same way anywhere in the world

It shows where restoration activity has taken place and points ground inspection at the right parcels. It is not proof that the young trees survived.

Angela John



WHERE THE NUMBERS COME FROM

Our framework is developed and validated on globally distributed reference sites, with field data at a reforestation site in Kieni, Kenya: 98 % of the pixels that later became forest were marked early there, a median of four years before the canopy-based transition. Discrimination reached AUROC 0.901 on a spatially separate test set and a median of 0.781 across eight regions withheld from training; a national scale audit found 74 % of marked areas correct.



References

- Global Reforestation Dataset- John, A., Allotey, S., Koebe, T., Tyukavina, A. & Weber, I. (2025). A global dataset of location data integrity-assessed reforestation efforts. Scientific Data 12, 1714.
- Brown, C. F. et al. (2025). AlphaEarth Foundations: an embedding field model for accurate and efficient global mapping from sparse label data. arXiv:2507.22291.
- Drusch, M. et al. (2012). Sentinel-2: ESA's optical high-resolution mission for GMES operational services. Remote Sensing of Environment 120, 25–36.
- Aerial imagery: Google Earth Pro, historical imagery, Saarland (2018–2024).