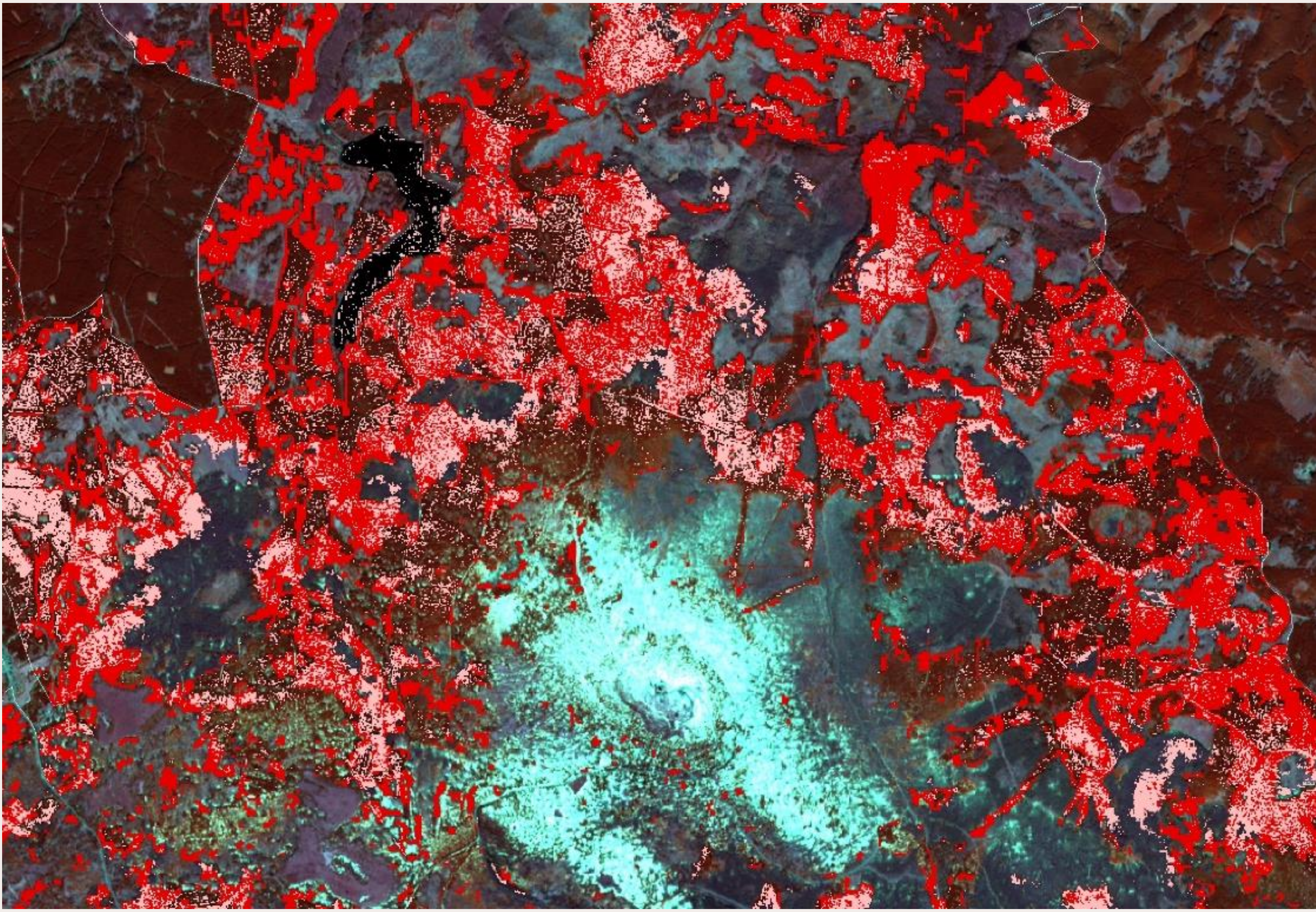# CVA as an early detector of water stress

Ingress! Should contain the essence of the content. What is this poster about? What did you find? The ingress must be short, clear and no more than three lines!

Comparison of the CVA and OBIA
- 🔴 estimated forest loss area between April 2019 and 2020 (OBIA)
- 🟡 Conifer forest under drought stress between April and June 2019 (CVA)

Introduction

While bark beetles are a natural part of the ecosystem the latest rise in average temperature causes big problems for Europe´s conifer forests. Bark beetle outbreaks have previously been stopped as larvae would naturally die off by cold temperatures in winter. But warm winters have made uninterrupted beetle reproduction possible.

Moreover, the beetle´s devasting impact increased as hot, dry and long summers and storms have weakened the trees natural defense ability. To halter the beetles spread, logging is common practice. An early detection of bark beetle infestation zones would improve the effectiveness as timely measure could be put in place before the beetles spread into neighboring, healthy forest.

Remote sensing of bark beetle infestation

Beetle infestation can be divided into three phases:

1) "green attack" – early infestation without visible damage
2) "red attack" – infested tree with visible damage
3) "grey attack" – dead trees

In order to properly manage the forest, it is crucial to detect the "green attack" stage. As the beetle infestation is linked to stress induced by drought, Vegetation Indices (VIs) such as NDVI and NDWI.

Study area

The "Nationalpark Harz" is located in middle Germany. The national park was established in 2006. Most of the area is forested. 60% of the forested area is in the so-called "core zone", a zone that is left untouched by human intervention. However, the forest is massively infested by bark beetles and experiences noticeably tree mortality. The administration has introduced rules to protect surrounding forests but to not intervene in the core zone.
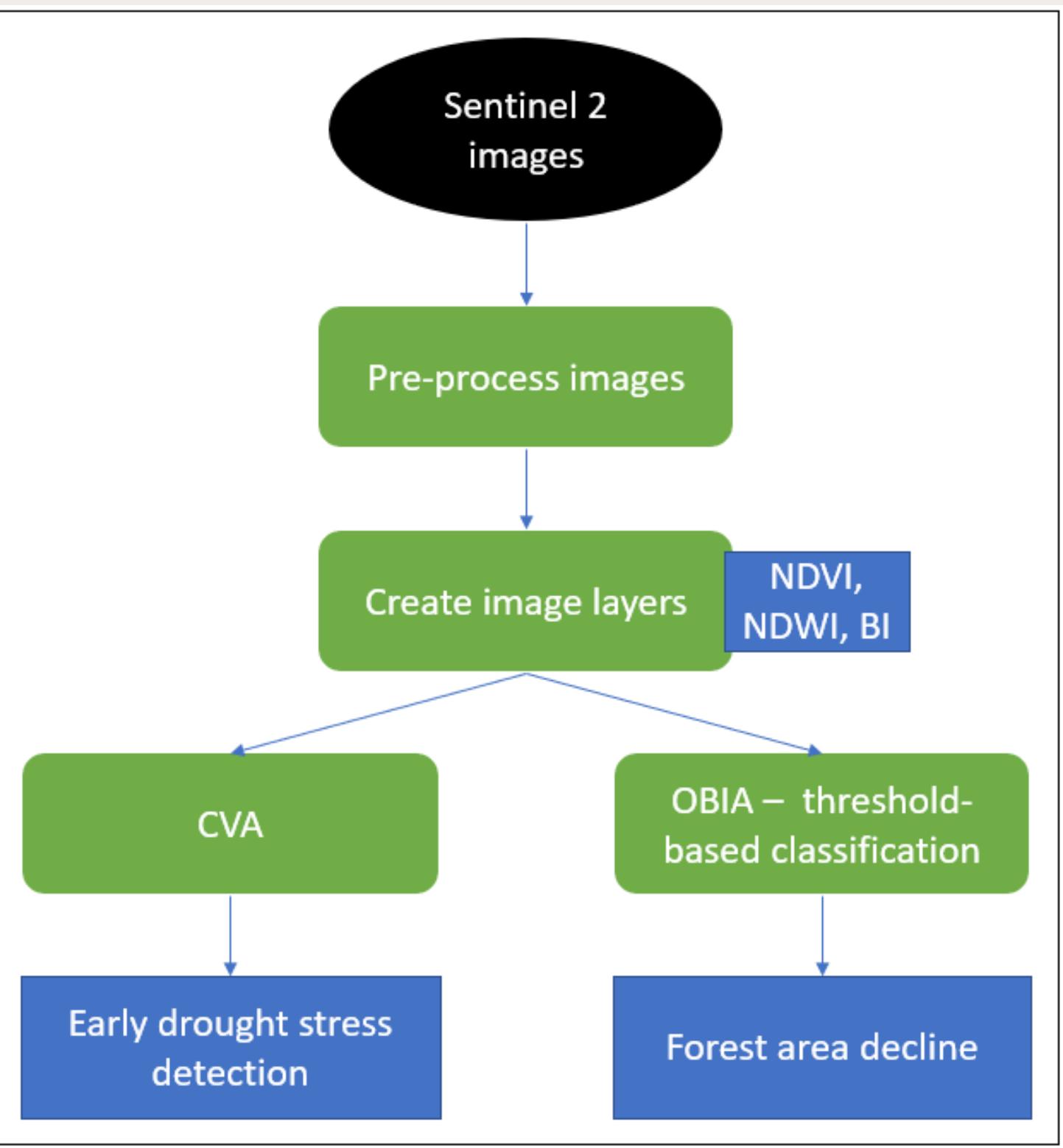
Data and Method

Free satellite imagery has been acquired from the Sentinel 2a and 2b mission. The satellite images show the eastern part of the national park.

OBIA

In order to map the decline in conifer forest area, two satellite images from April 17th of 2019 and April 19th, 2020 were classified via a threshold-based classification. The classification was performed as an Object Based Image Analysis (OBIA) in eCognition.

Comparison of the OBIA classification from April 2019 and 2020
- 🟢 Conifer forest April 2020
- 🟢 Conifer forest April 2019

CVA

Subsequently, this result was served as a reference to the Change Vector Analysis (CVA). The CVA was based on NDVI and NDWI values extracted from Sentinel 2 images from April and June 2019. The CVA defined an area in which a simultaneous decline in NDVI and NDWI has been detected.

Results

20% of the CVA generated area overlaps with the OBIA generated area that was used as a reference.
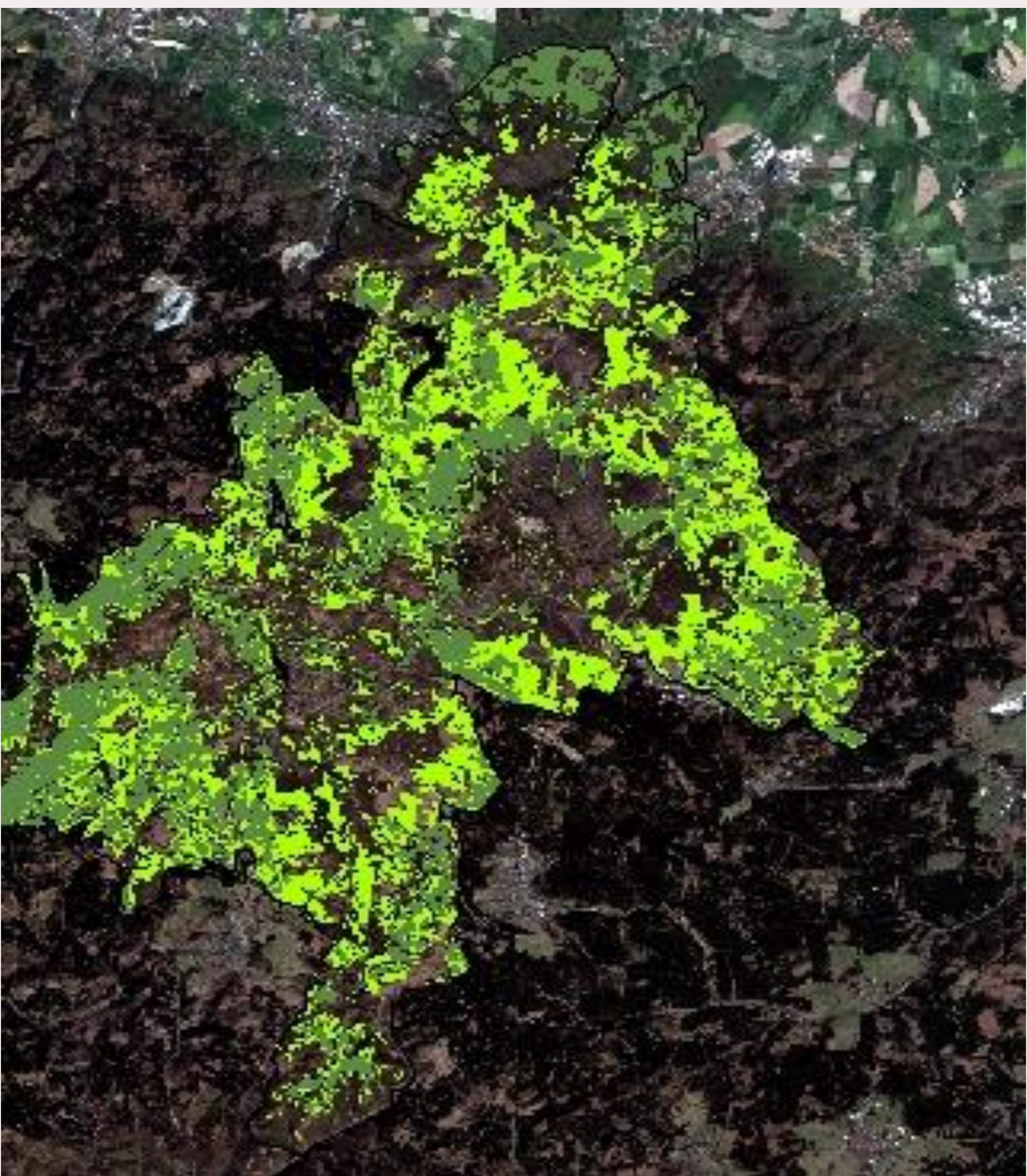
Conclusion

The accuracy of the method is not enough to base forest management on it. It can serve as an early detection which would have to be verified by field data.

Conifer forest in the national park core area

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