

Report

Rhododendron detection

Locatie:
Estate t Twickel, Delden
Netherlands

Vlucht datum:
06 March 2018

Client:
Borgman Beheer

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Classification of Rhododendron in t Twickel, Delden. 6 March 2018

On 6 March 2018 HiView has executed flights above the Twickel estate in Delden, in the eastern part of the Netherlands. The purpose of the job, assigned by Borgman Beheer, was to detect Rhododendron that is abundantly growing in certain segments of the estate and forms a threat notably to the oak forest.

This report is tentative, the definite report will be issued later in cooperation with Borgman.

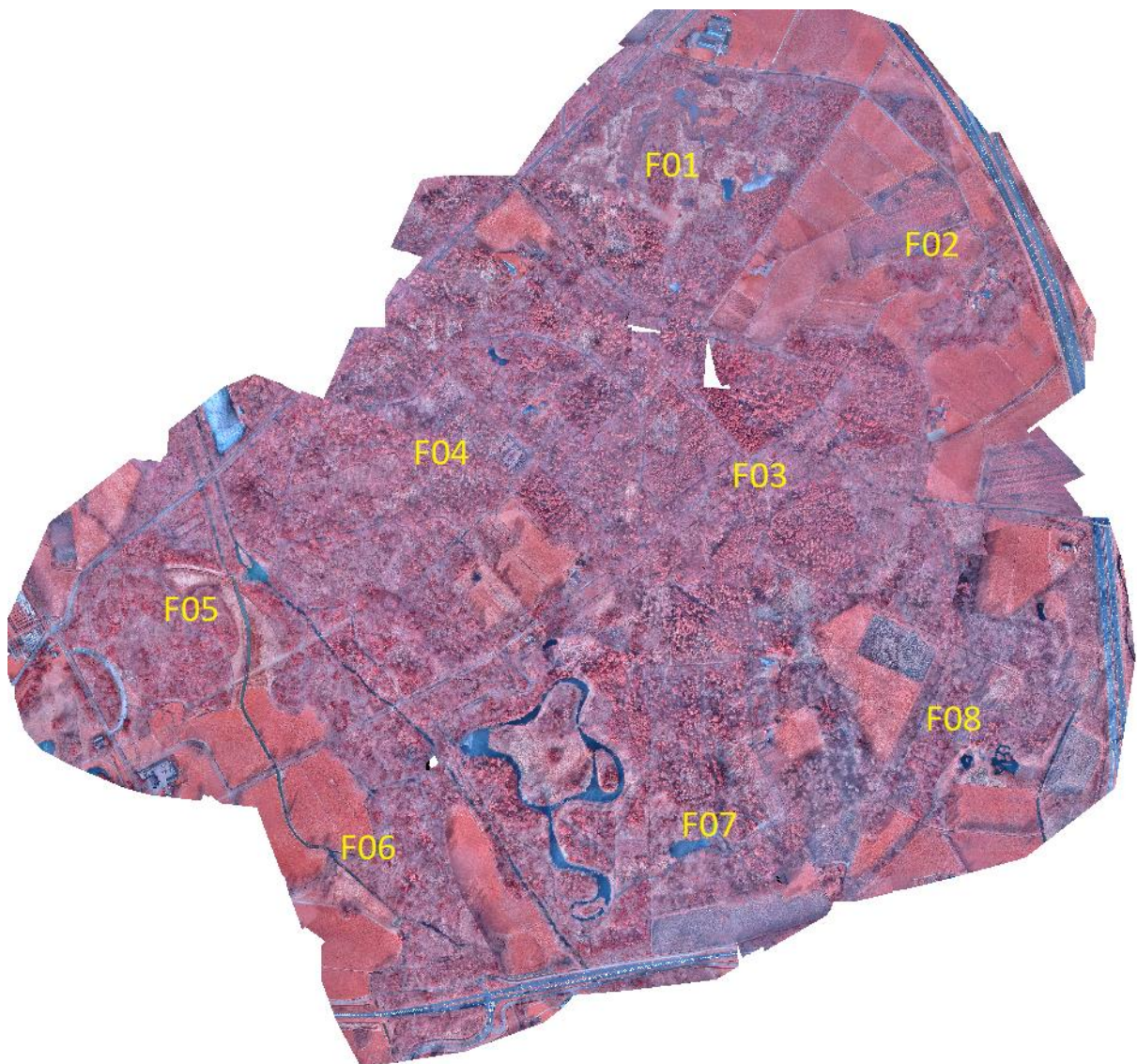
Underneath, after the overview of Flight Areas (chapter I) we have collected the results from the classification (chapter II). It is followed by an overview on ground validation activities (chapter III). Finally comes a comparison of three classification methods, PCA, SCP and NDVI (chapter IV). From this comparison we selected SCP to perform the classification of Rhododendron. The resulting maps show land coverage of Rhododendron, that is mingled with Ilex and Taxus at certain areas up to a 5 to 10 percent.

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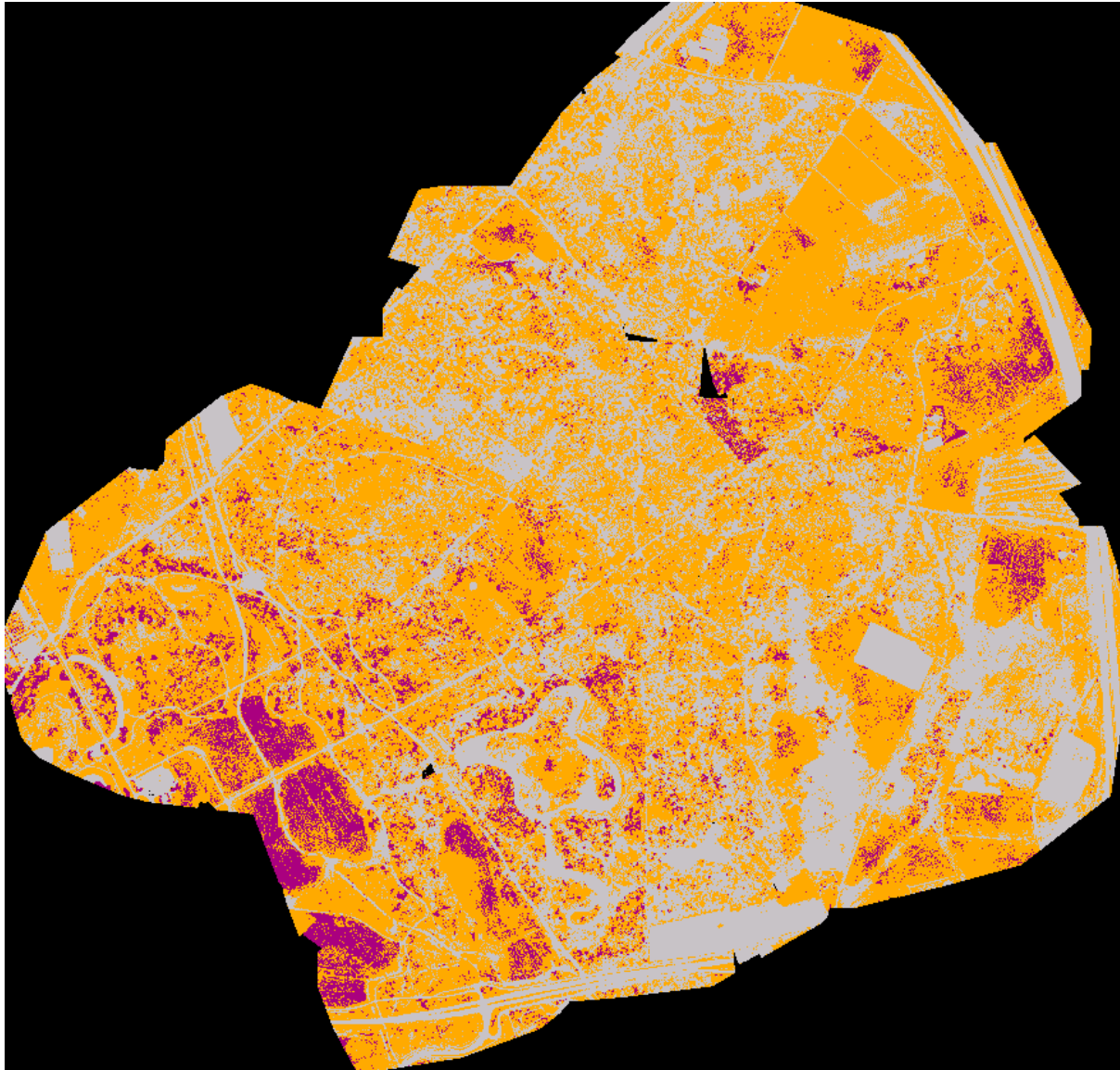
I. Overview of Flight Areas (F01-F08)

For the view of high resolution images we refer to the digital files that are delivered together with this temporary report.



II. Overview of SCP 3CL classification of 8 Flights(F01-F08)

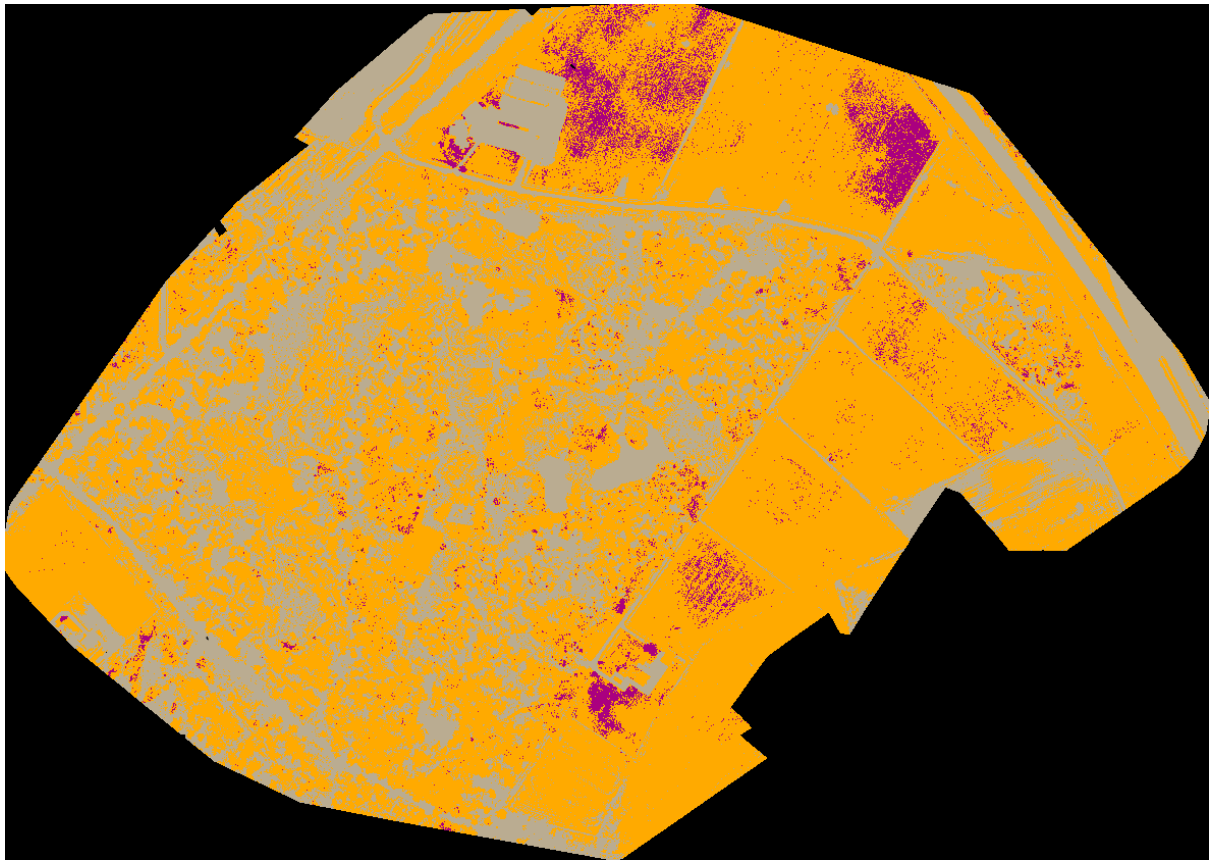
Classification of merged images, processed at a resolution of 0,20m/p



500 m

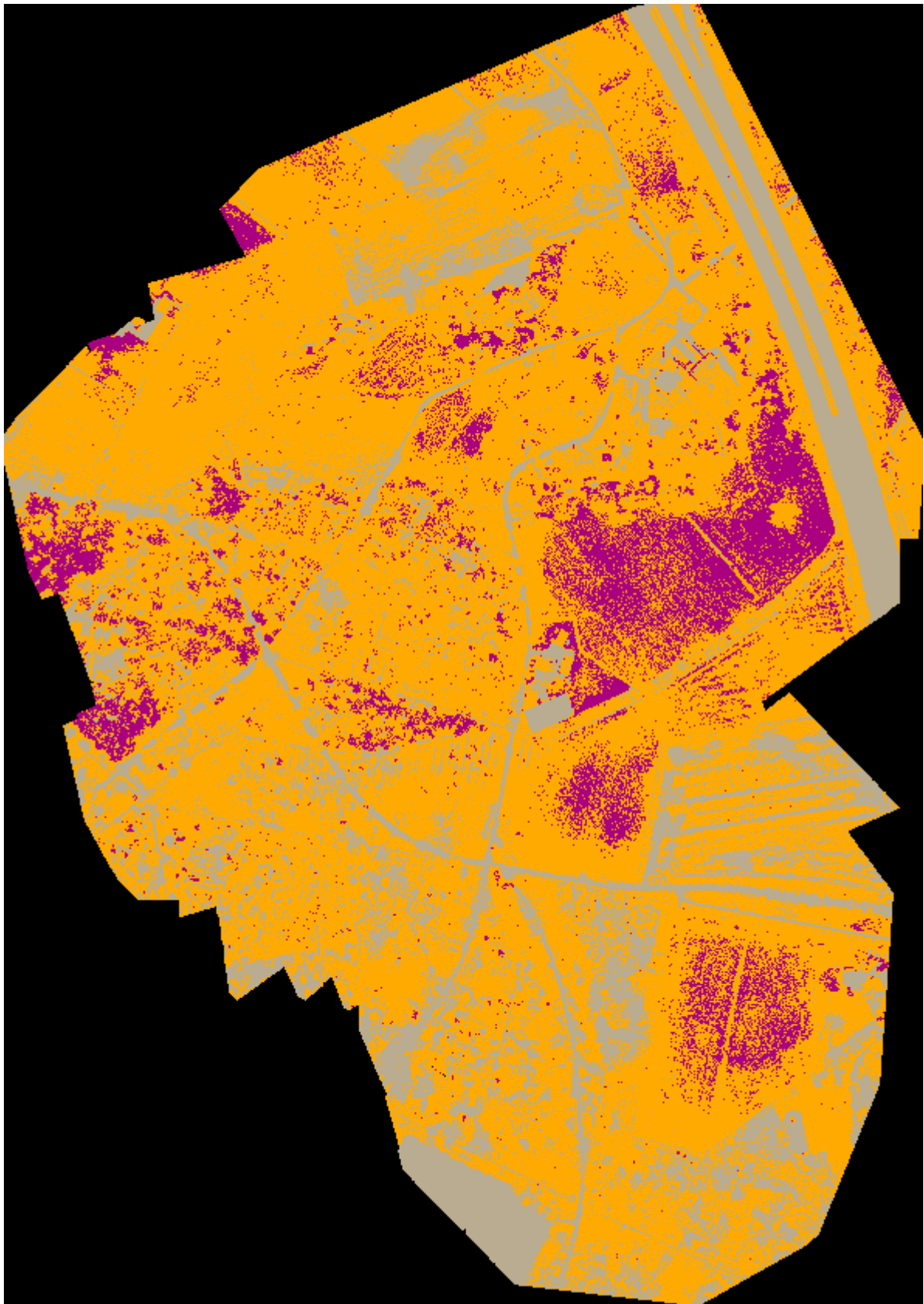
Classification of separate images, processed at a resolution of 0,10m/p

F01



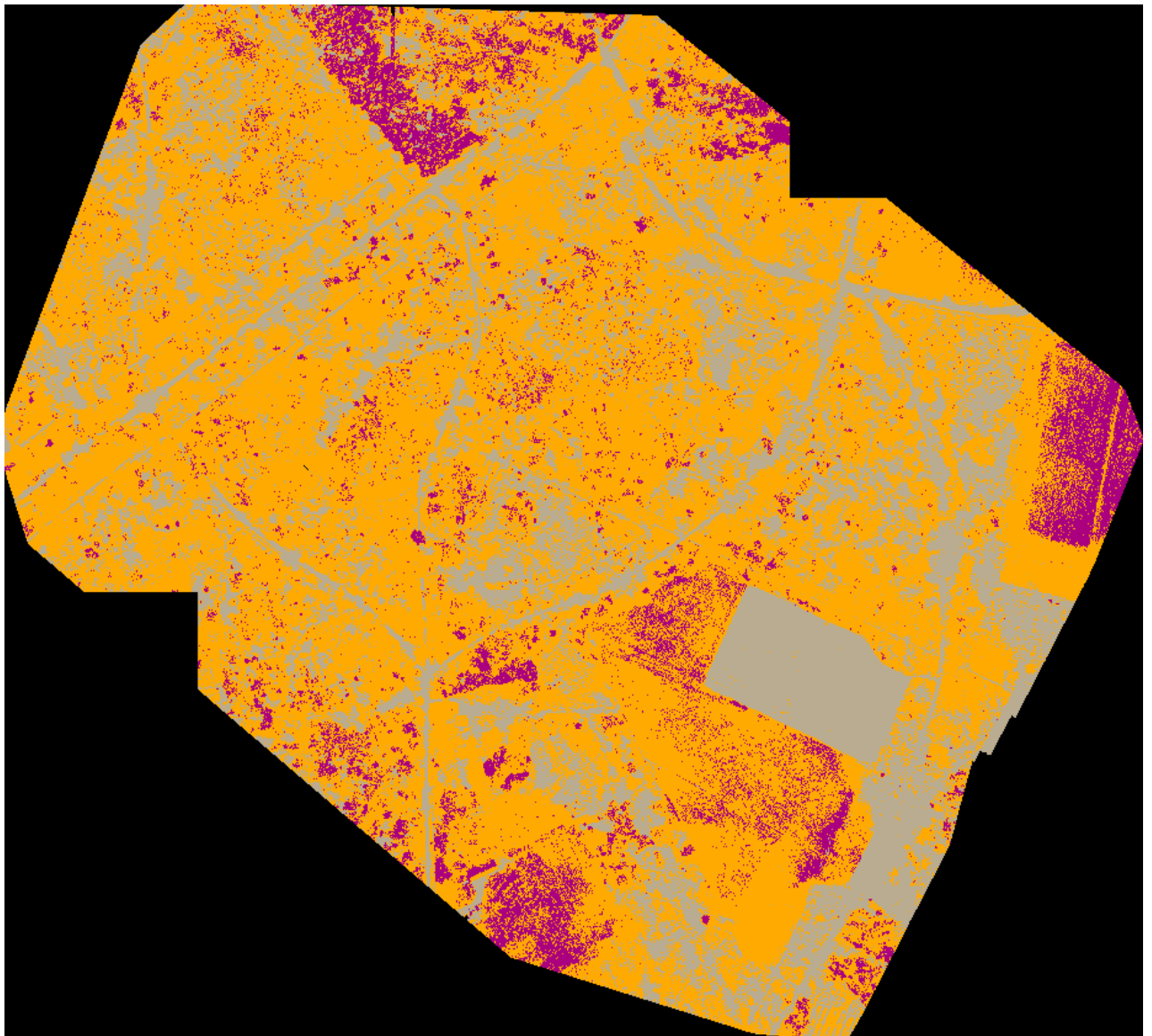
200 m 

F02



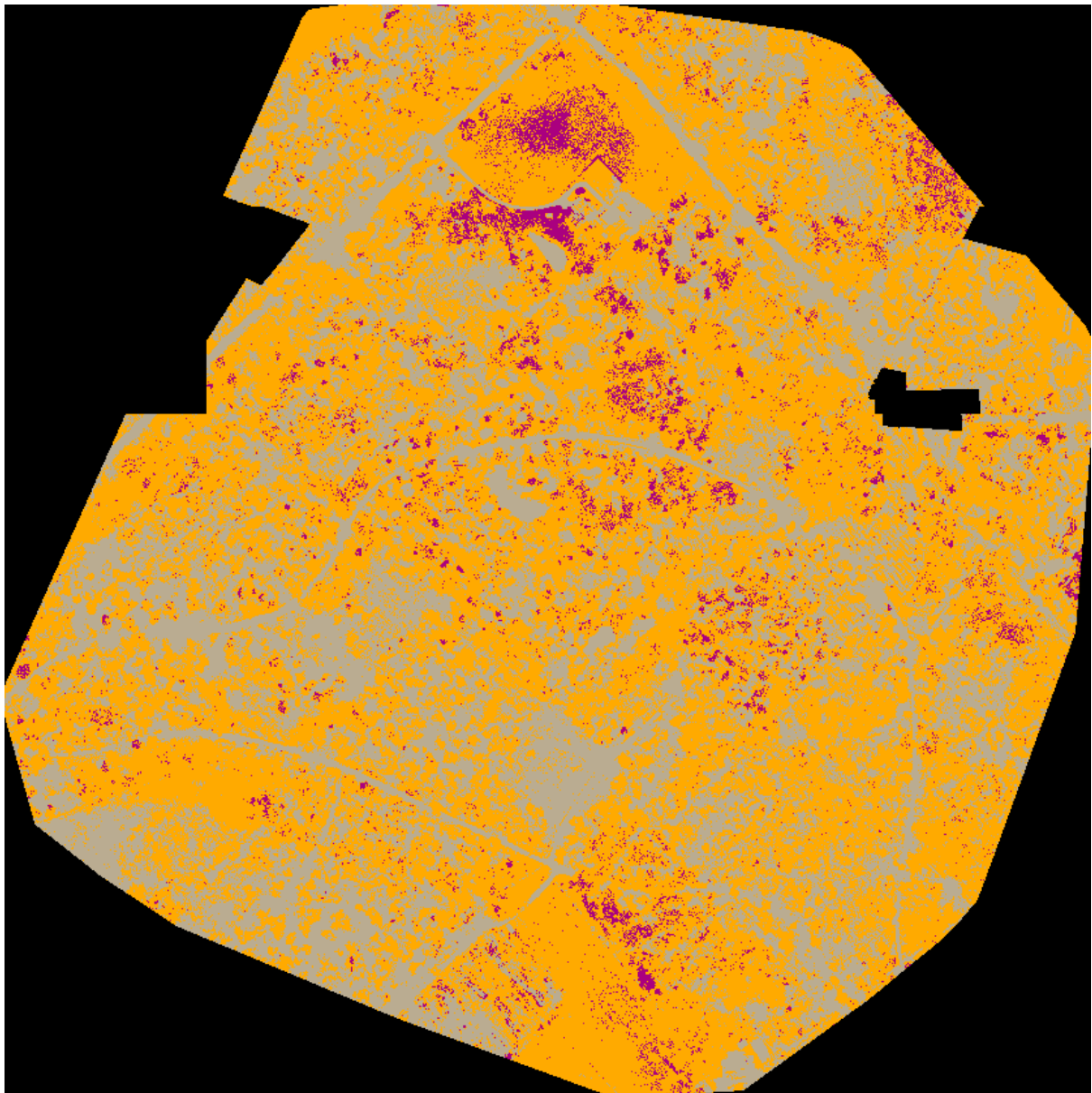
200 m

F03



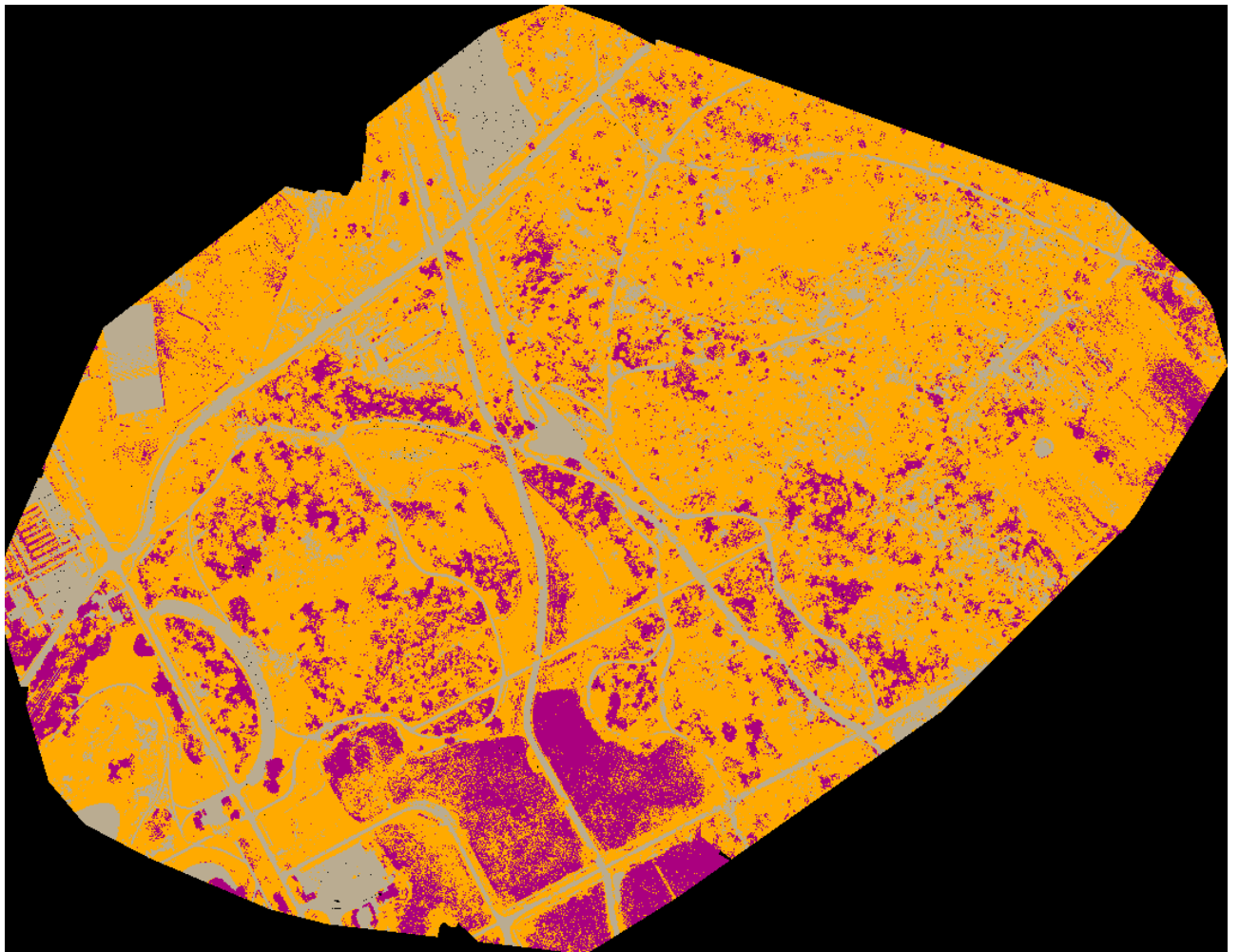
200 m

F04



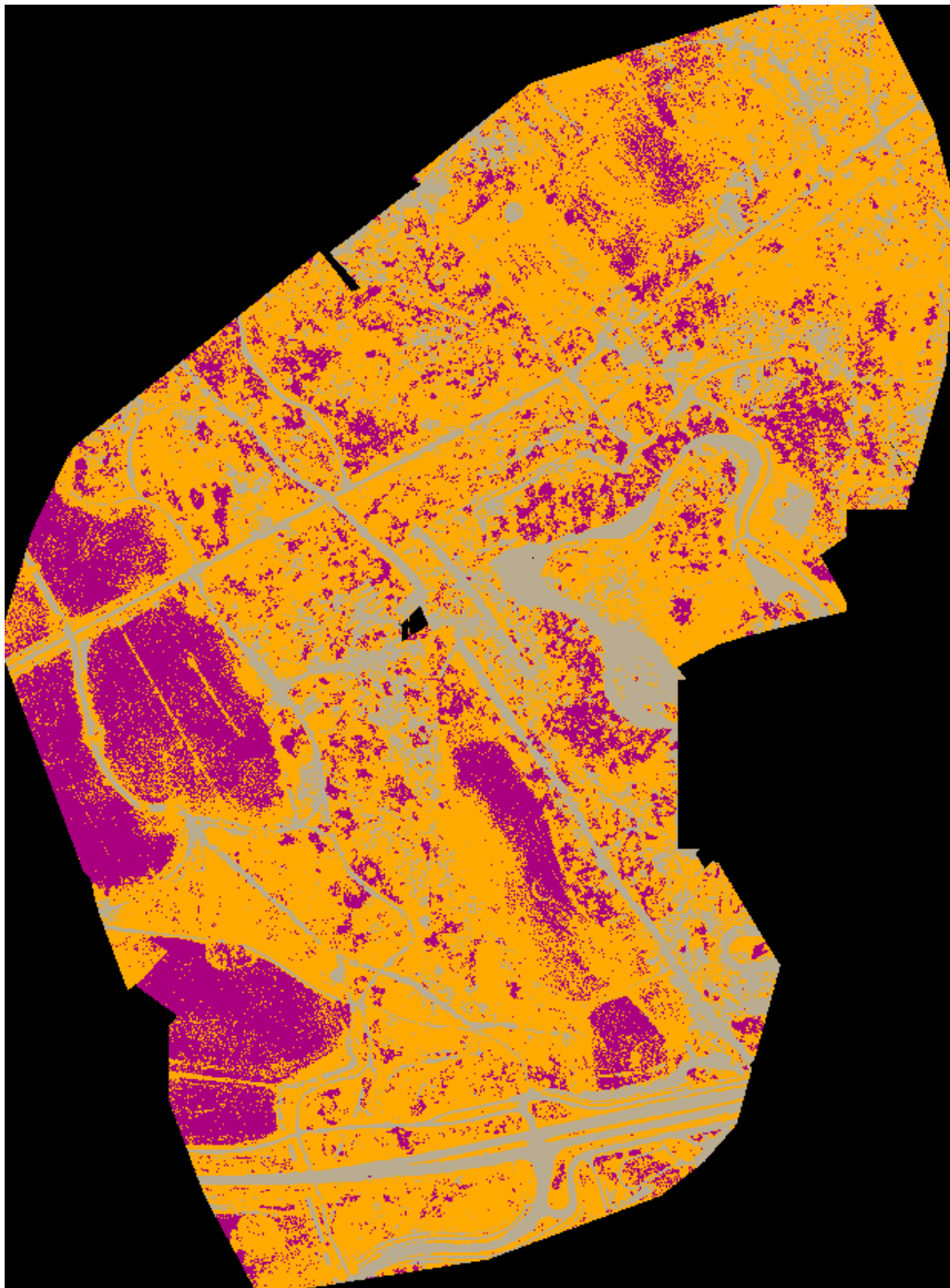
200 m 

F05



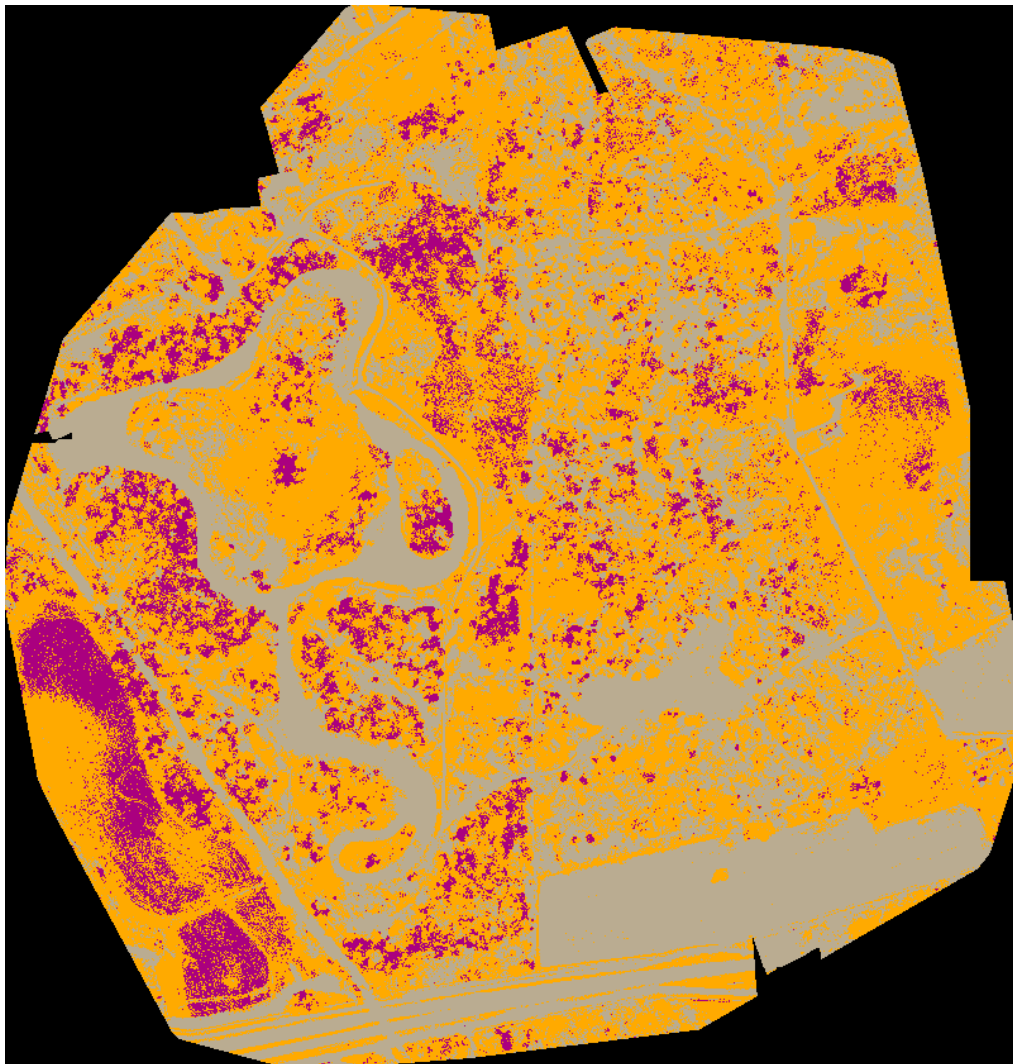
200 m 

F06



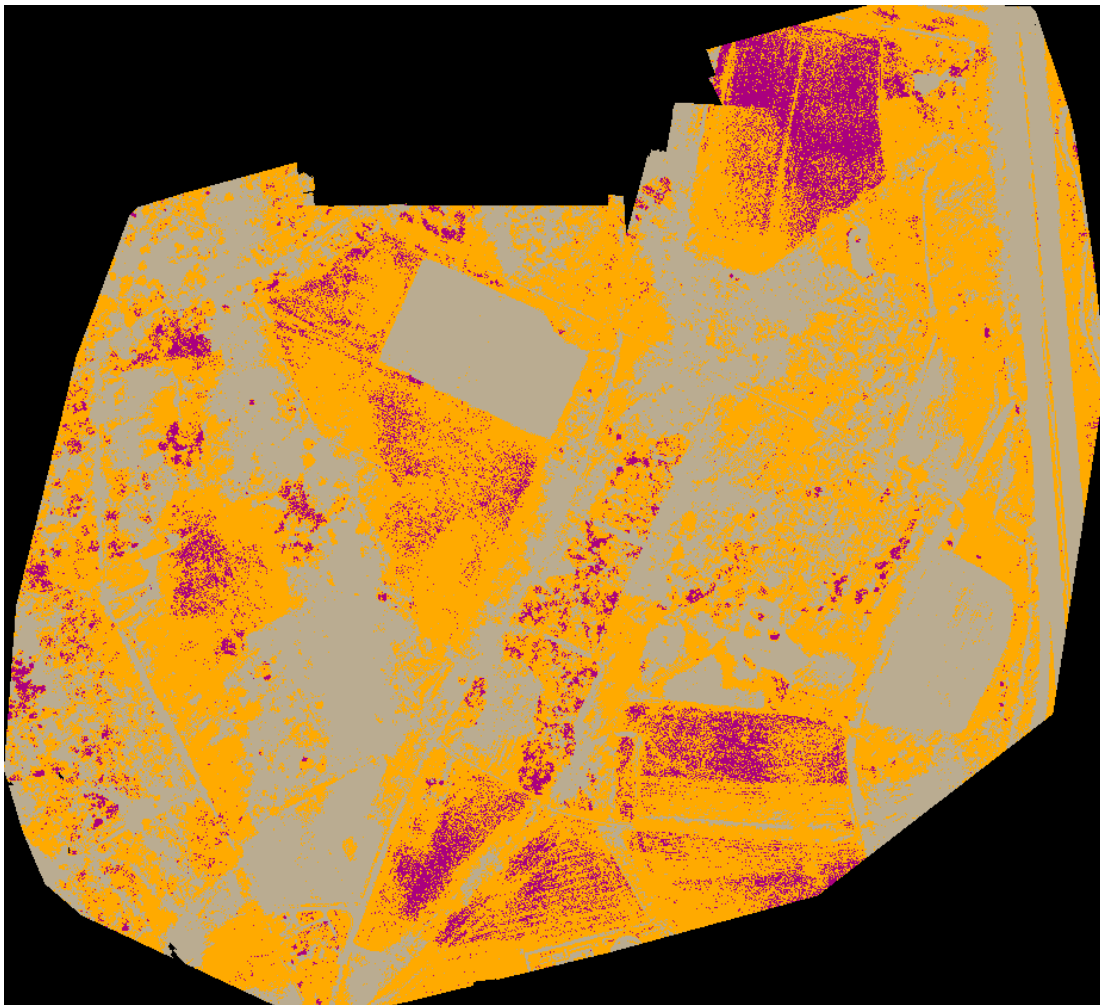
200 m

F07



200 m 

F08



200 m

III. Ground validation NIR images

Introduction

On Friday 16 march 2018 Nico Spliethof from Borgman Beheer and Jan van Til from HiView have performed a ground validation. Nico has registered points and planes with the help of GPS. Jan has registered on ground images of vegetation with the help of the Avenza app and a tablet. Attention was focused on trees and shrubs that are close to Rhododendron in the visual and near-infrared spectral bandwidth.

For the view of high resolution images, we refer to the digital files that were delivered together with this temporary report.



Fig 1. Overview of GPS measured points and planes

500 m



Fig 2. Overview of placemarks in Google Earth

A selection of 9 subsets has been made based on the vegetation that is relevant for Rhododendron classification. These subsets correspond to the followings Avenza placemarks: P01, P06, P08, P12-13, P15, P18, P19, P20, P23.

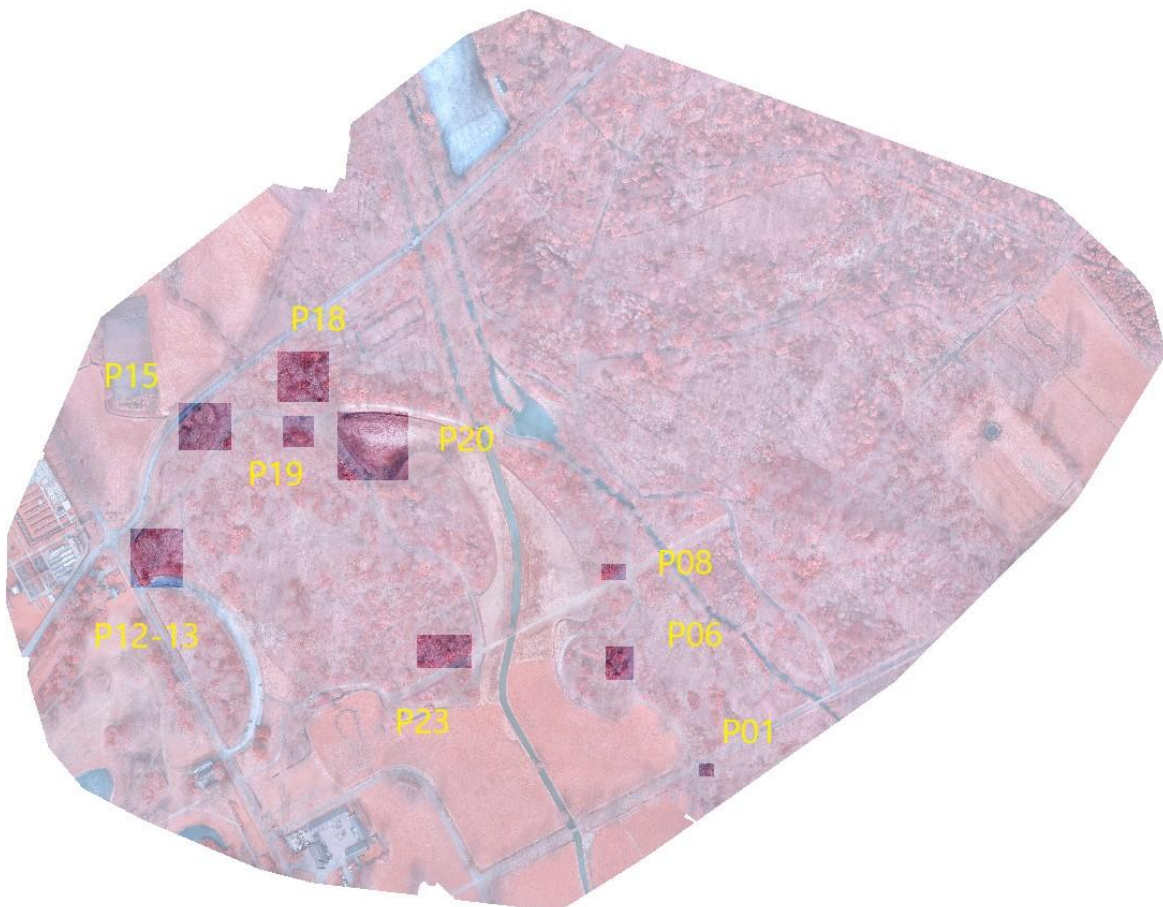


Fig. 3 Overview of the placemarks

500 m 

Overview ground validation

Below is a list of abbreviations that are used to designate different types of vegetation:

B	Beech
Br	Blackberry
C	Conifer
E	Oak
G	Grass
H	Ilex
K	Ivy
M	Moss
P	Pitrus
R	Rhododendron
Sd	Douglas spruce
Sf	Norway Spruce
T	Yew tree

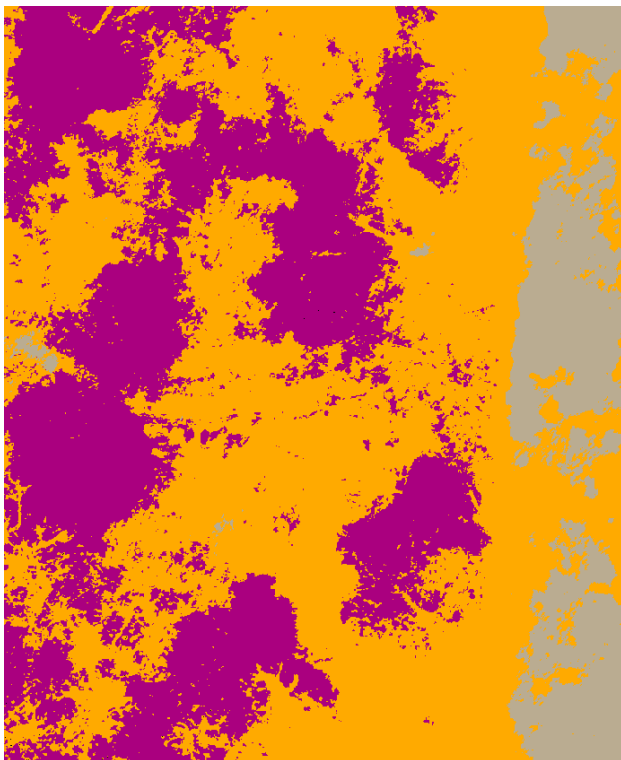


Fig 4. Placemark P06, NIR and SCP. Vegetation: H, R.

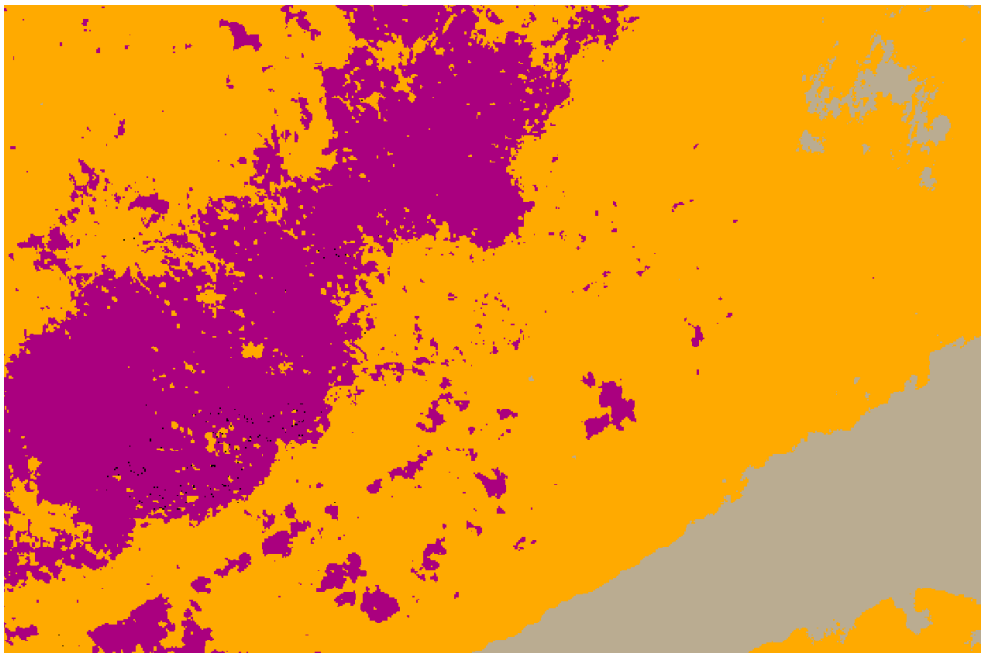
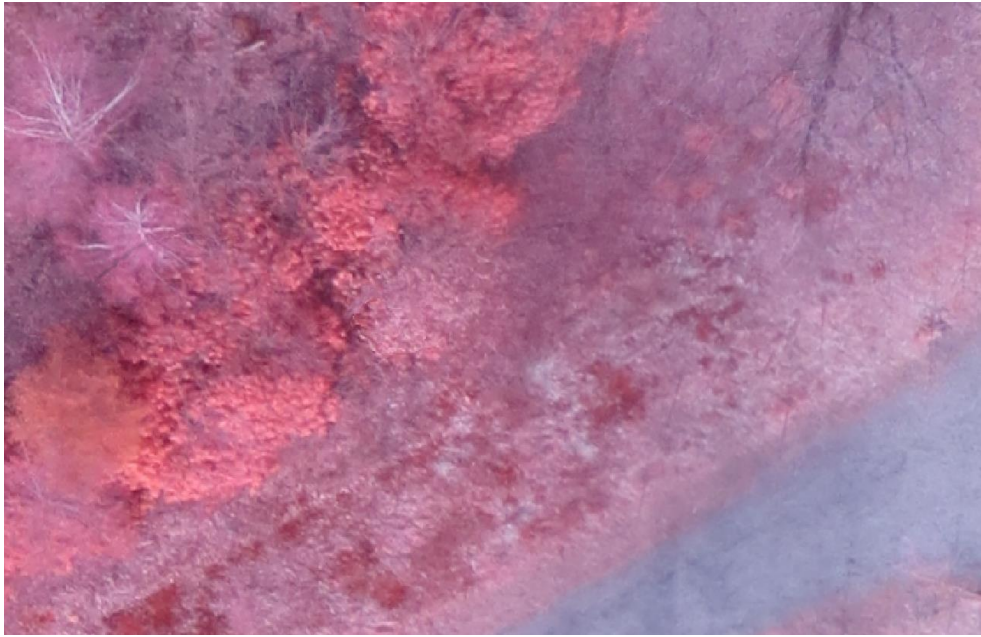


Fig 5. Placemark P08, NIR and SCP. Vegetation: Br-H-R-Sd

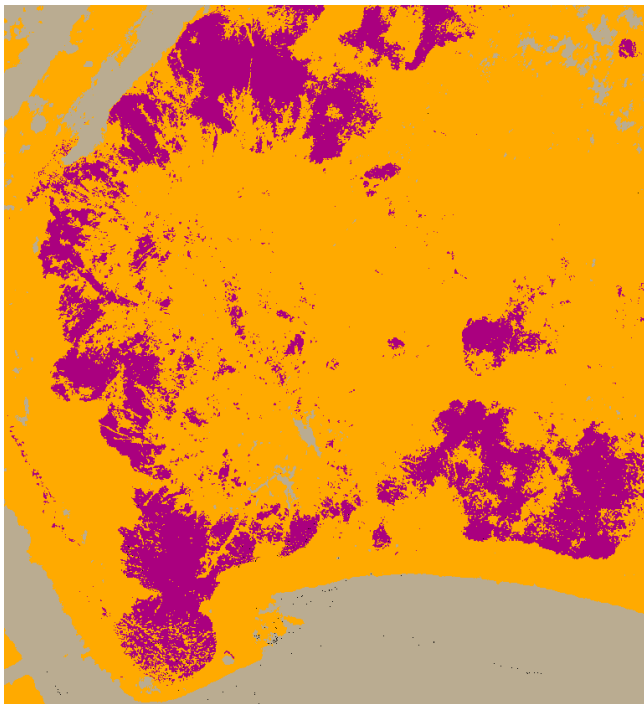
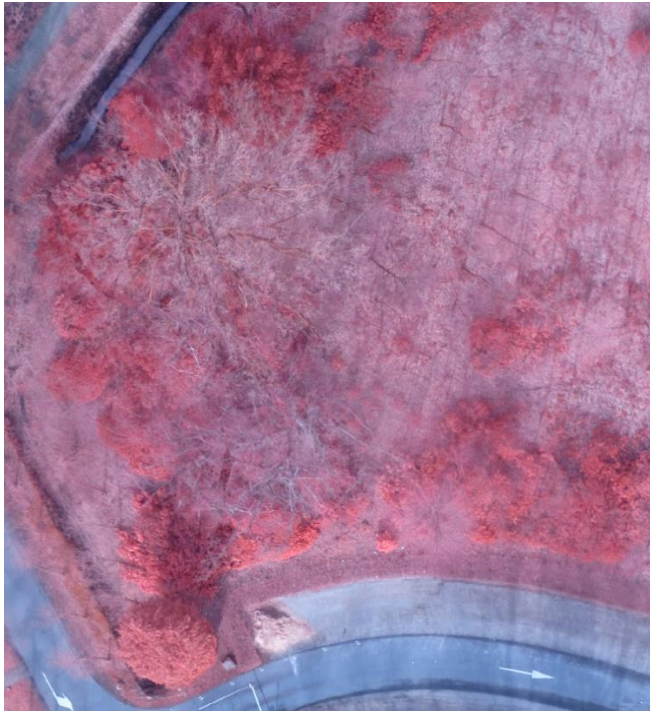


Fig 6. Placemark P12-13, NIR and SCP. Vegetation: B-C-E-H-R-T

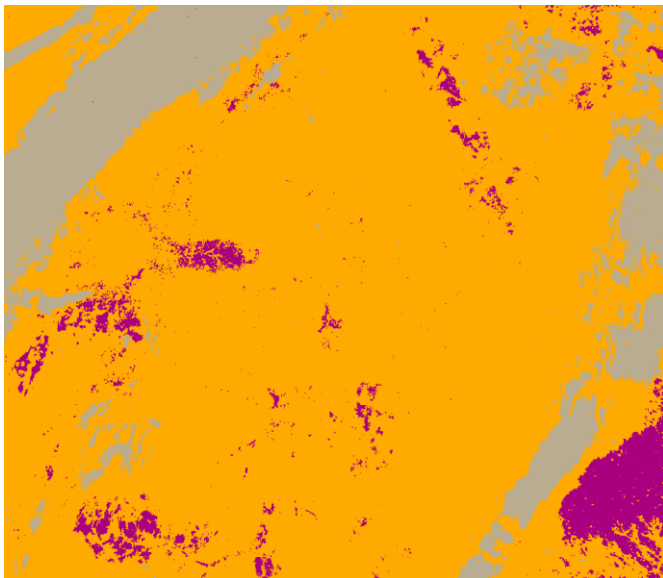
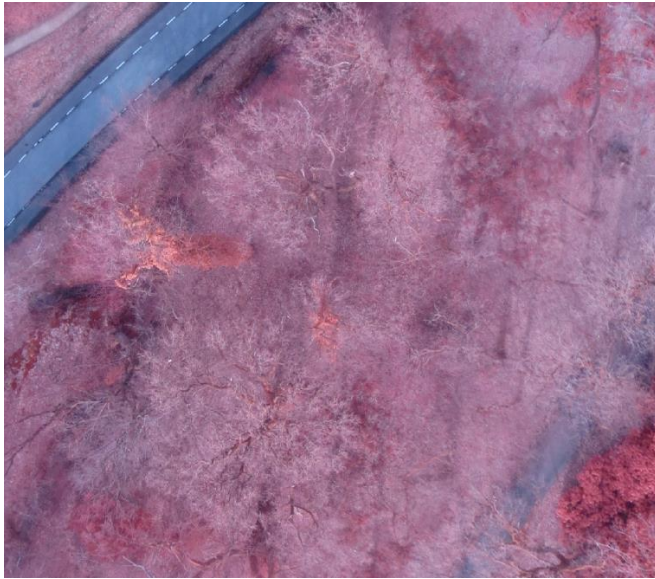


Fig 7. Placemark P15, NIR and SCP. Vegetation: Br-E-H-K-T

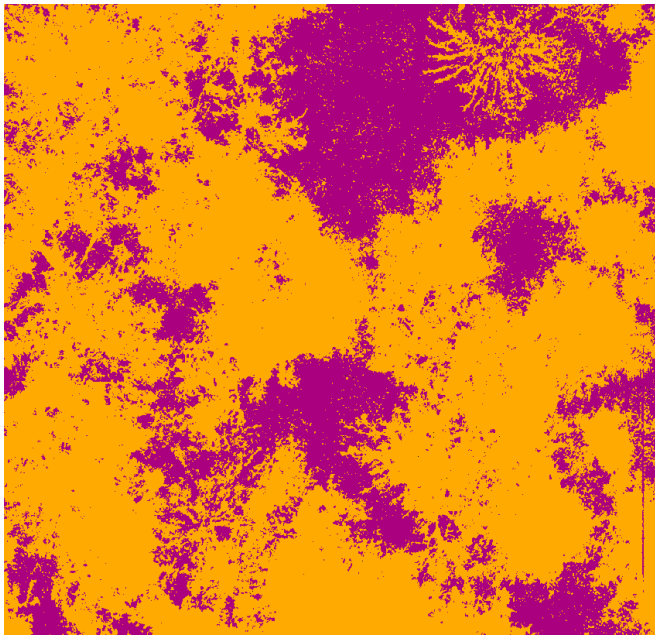
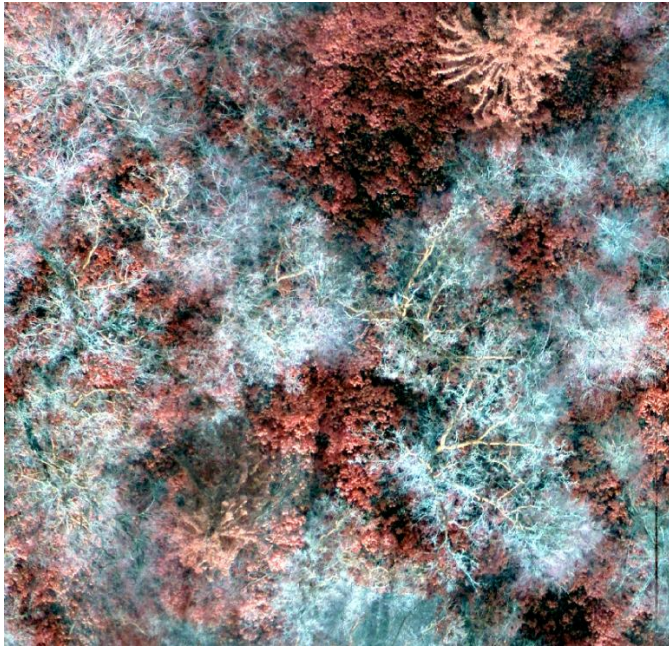


Fig 8. Placemark P18, NIR and SCP. Vegetation: E-Fs-R

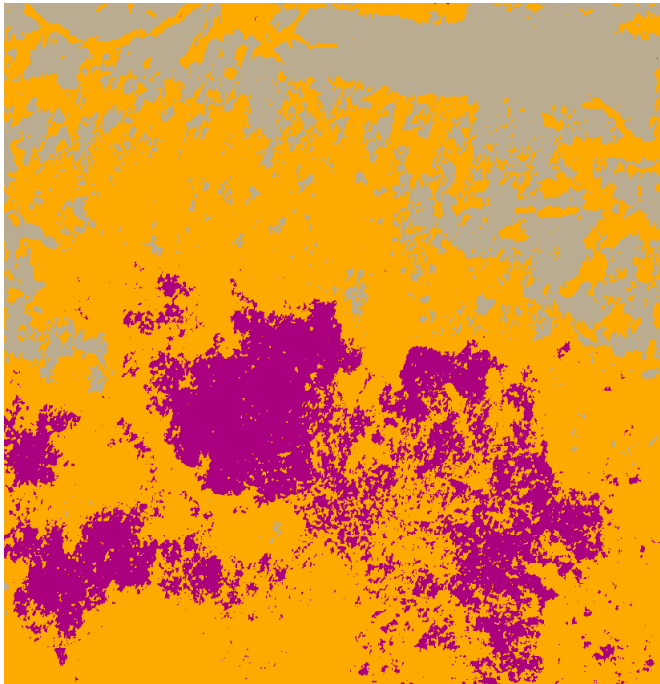


Fig 9. Placemark P19, NIR and SCP. Vegetation: Br-Sf-R

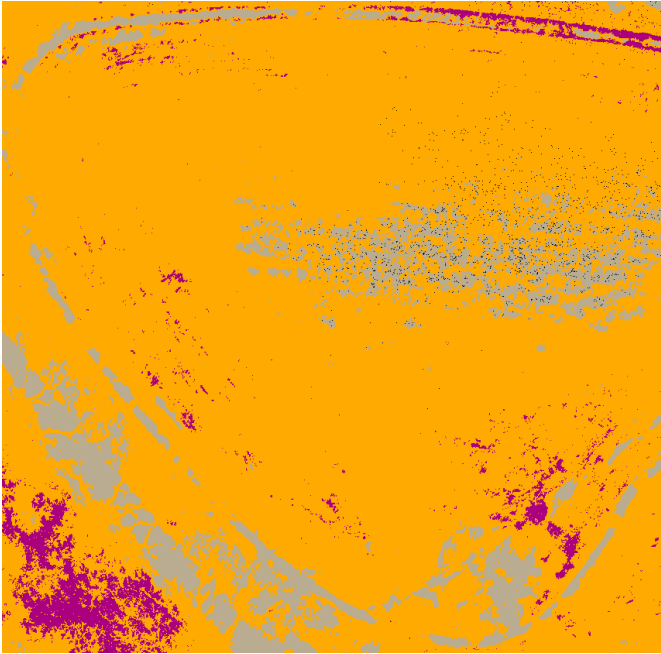
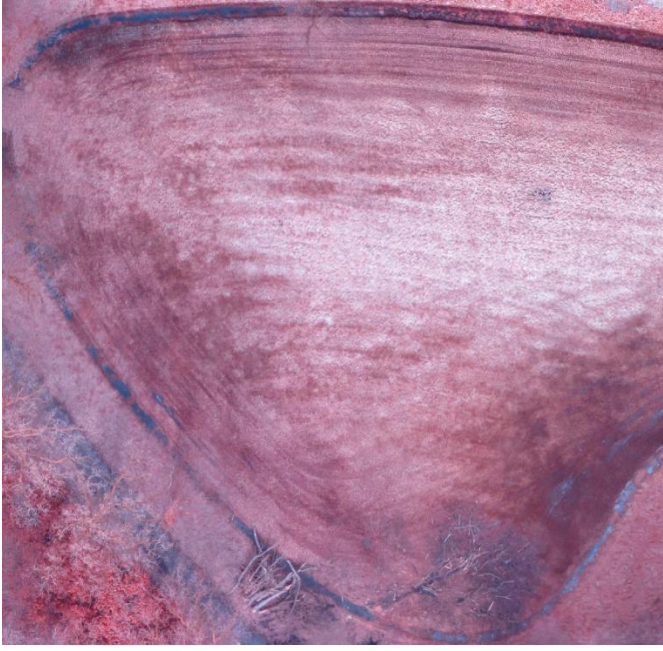


Fig 10. Placemark P20, NIR and SCP. Vegetation: G-P

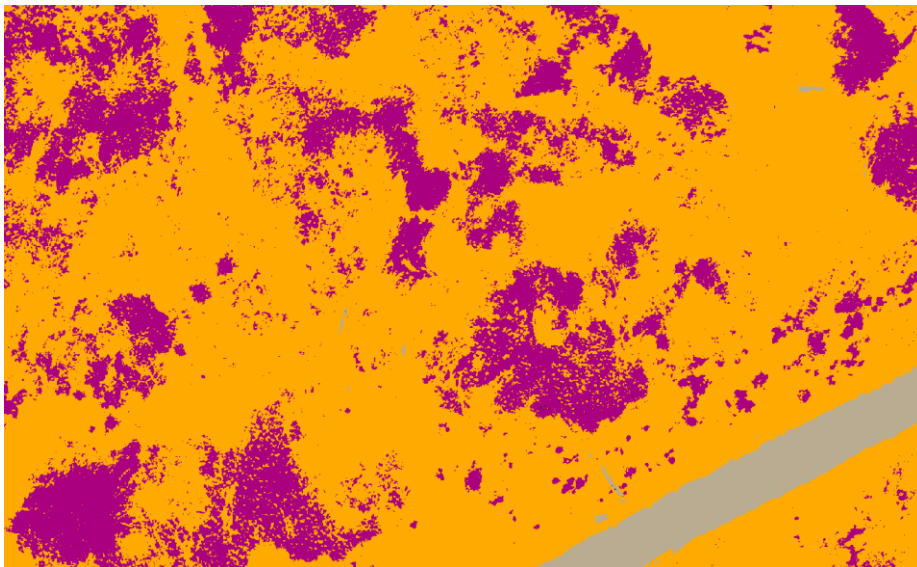
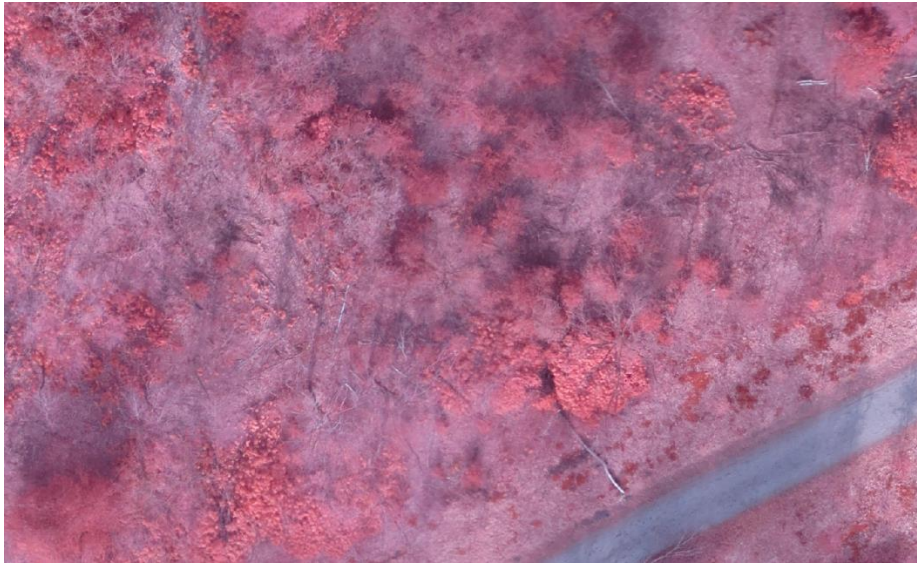


Fig 11. Placemark P23, NIR and SCP. Vegetation: D-H-R-M

IV. Comparisons subsets from F05: NIR-PCA-SCP-NDVI

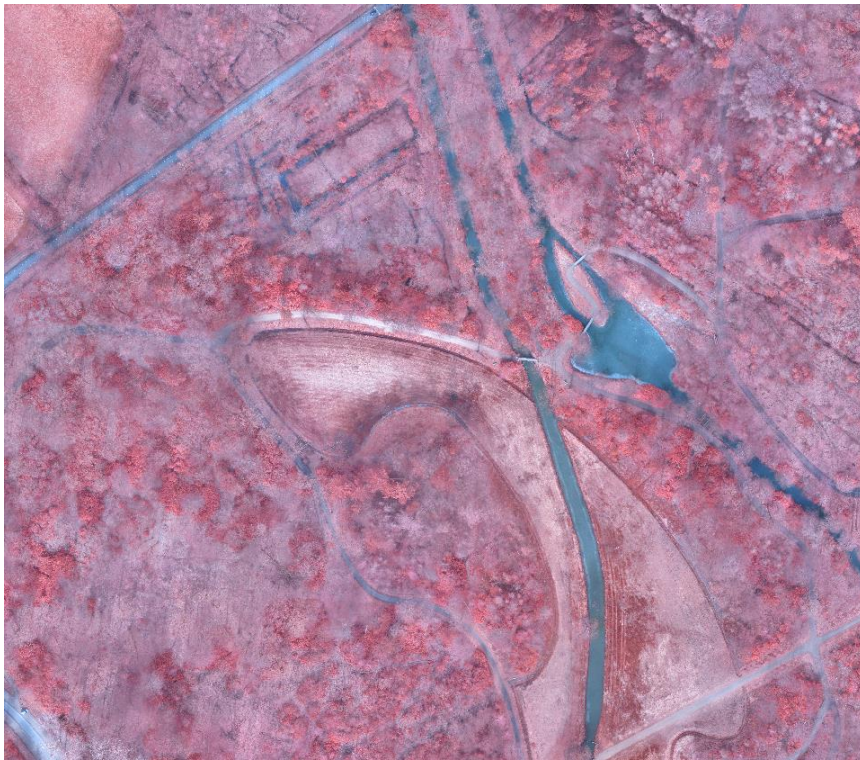
Below is an overview of four different subsets from Flight Area 5 (F05). Comparisons have been made between different methods of classifications: PCA (principal component analyse), SCP (semi-automated classification plugin) and NDVI. The shown images are resulting from manual fine-tuning of the subsequent classification methods. SCP has been executed in 3 classes (3CL). NDVI has been executed in 7 and 3 classes (7CL en 3CL).

The three methods of classifications show minor differences in between. Finally we selected the SCP for our classification work because of the best accuracy.

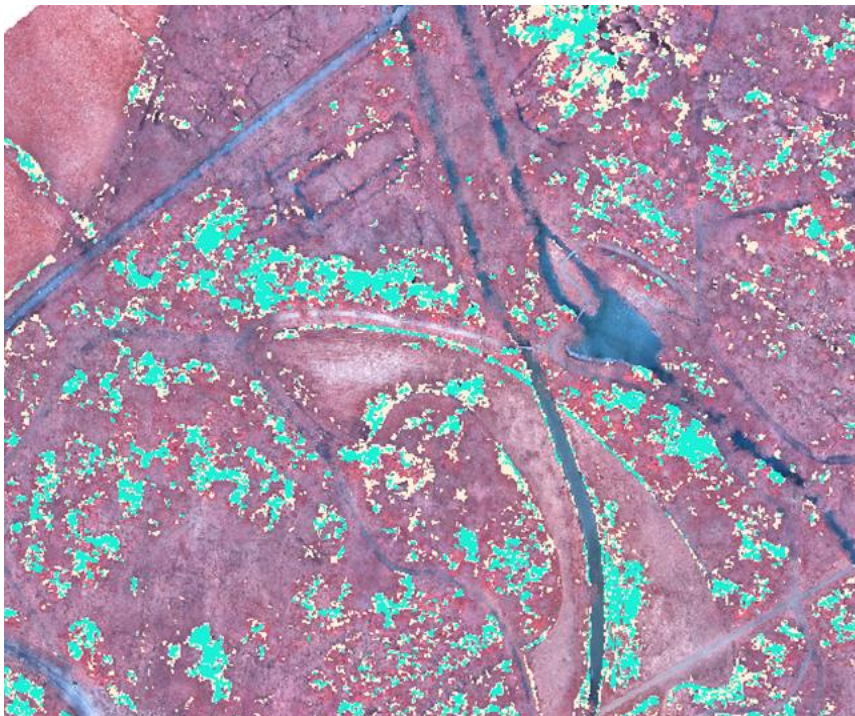
Rhododendron has been classified next to other types of vegetation like spruce, moss and Blackberry. Unfortunately, it appeared to be impossible to classify Rododendrom seperately from other neighbouring vegetation like Ilex and Yew-tree.

Altogether the resulting maps are very satisfactory to the green keepers and decision makers that now dispose of quantified and localized information on the presence of Rhododendron in the Twickel Estate.

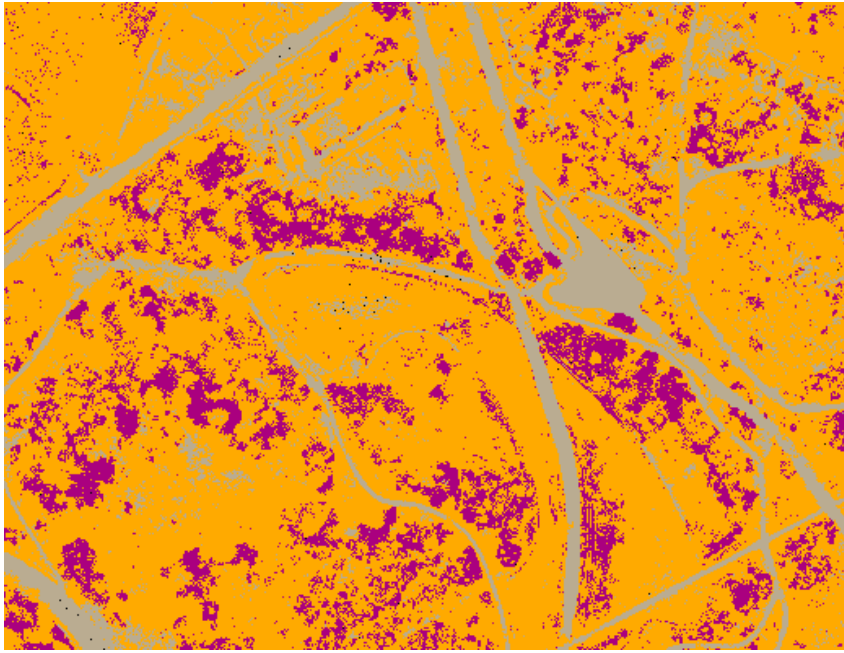
Comparison subset1 (F05): NIR-PCA-SCP-NDVI



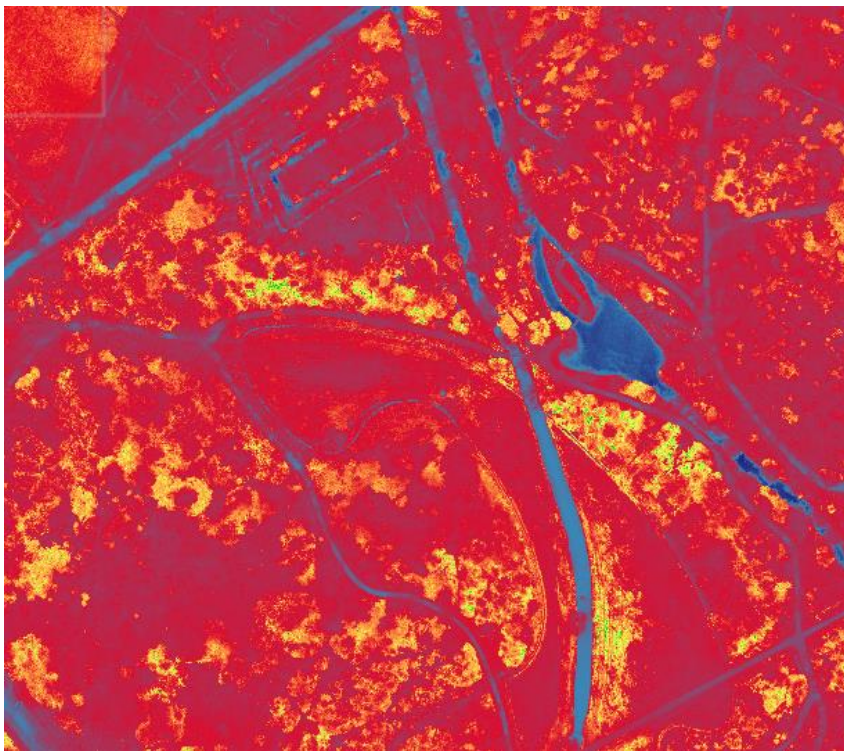
NIR



PCA

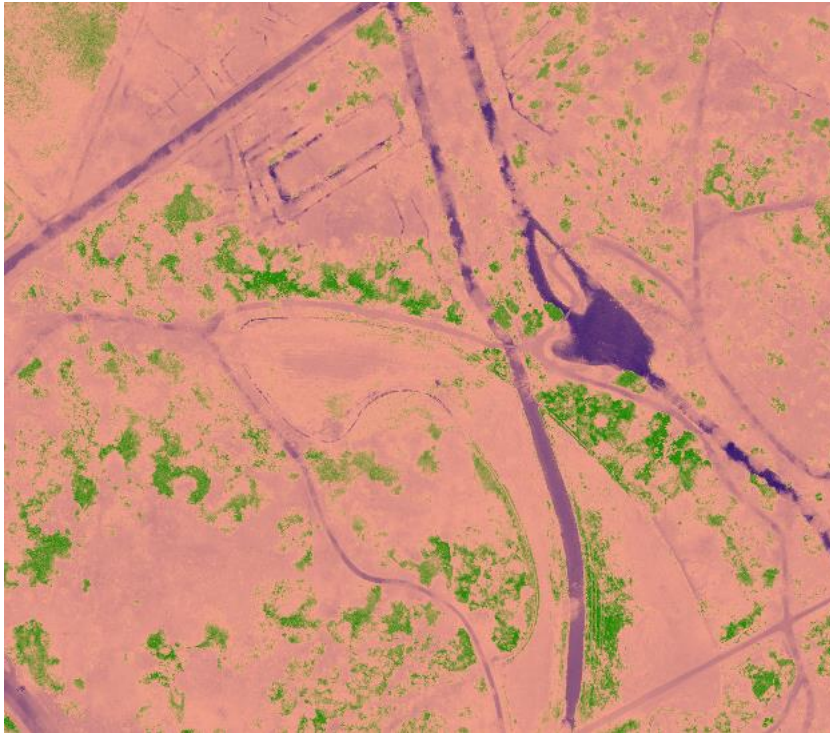


SCP 3CL



NDVI 7CL

Value	Color	Label
-0.7	Dark Blue	Custom color map entry
-0.3	Blue	0.150000
0.1	Red	0.239858
0.21	Orange	0.329716
0.29	Yellow	0.419575
0.35	Light Green	0.509433
0.4	Dark Green	Custom color map entry



NDVI 3CL

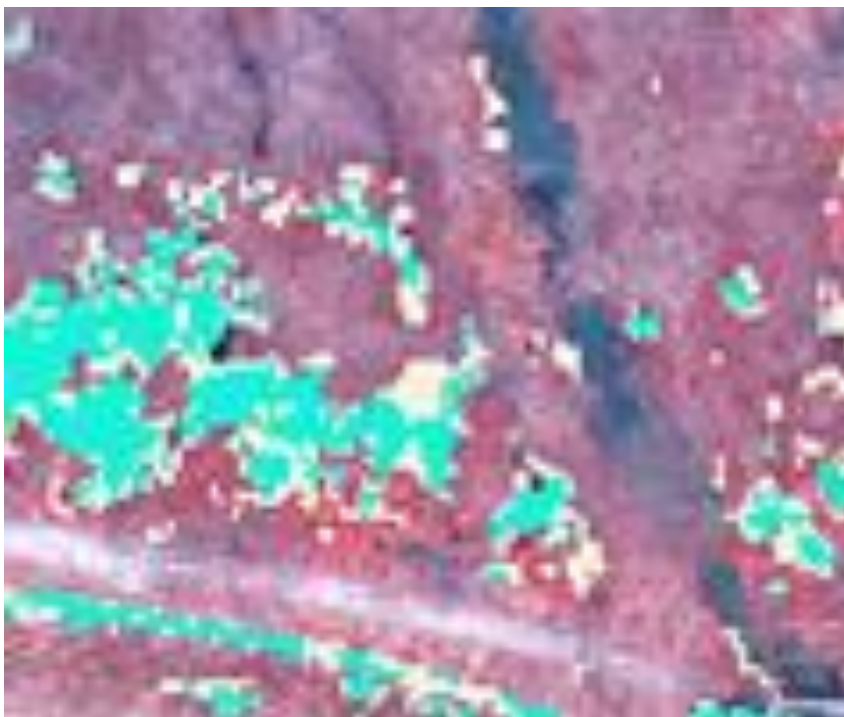
Value	Color	Label
-0.7	Dark Blue	Custom color map entry
-0.3	Blue	0.150000
0.1	Red	0.239858
0.21	Orange	0.329716
0.29	Yellow	0.419575
0.35	Light Green	0.509433
0.4	Dark Green	Custom color map entry

Value	Color	Label
-0.7	Dark Blue	Custom color map entry
0.1	Light Green	0.419575
0.3	Dark Green	Custom color map entry

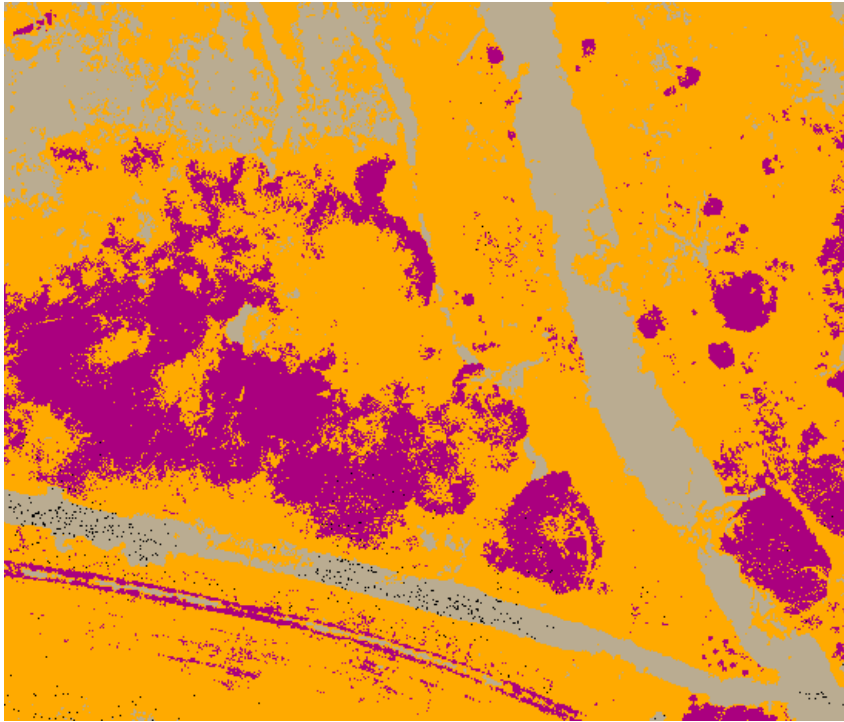
Comparison subset1b (zoomed in at subset 1, F05) NIR-PCA-SCP-NDVI



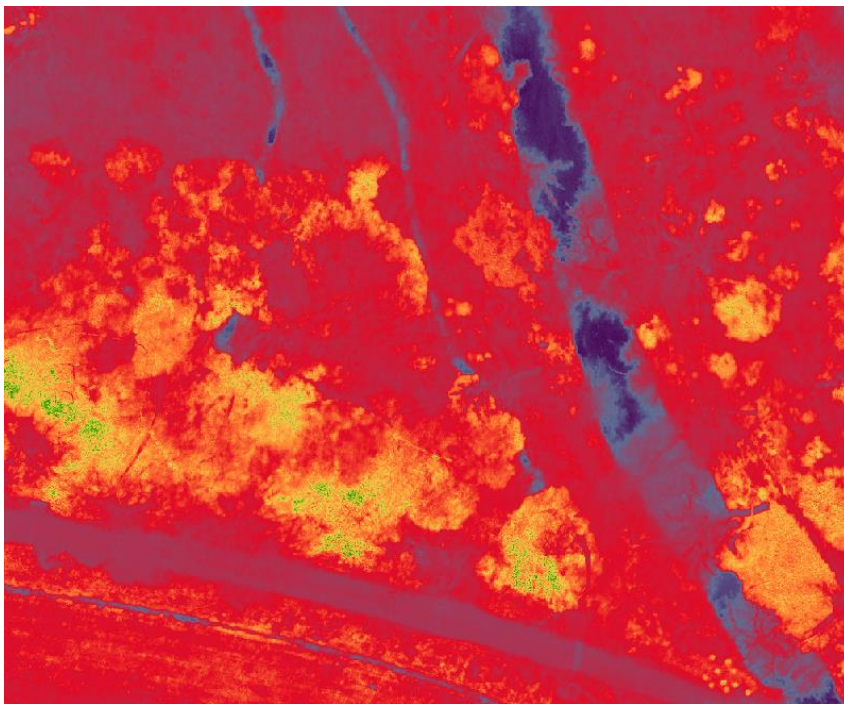
NIR



PCA

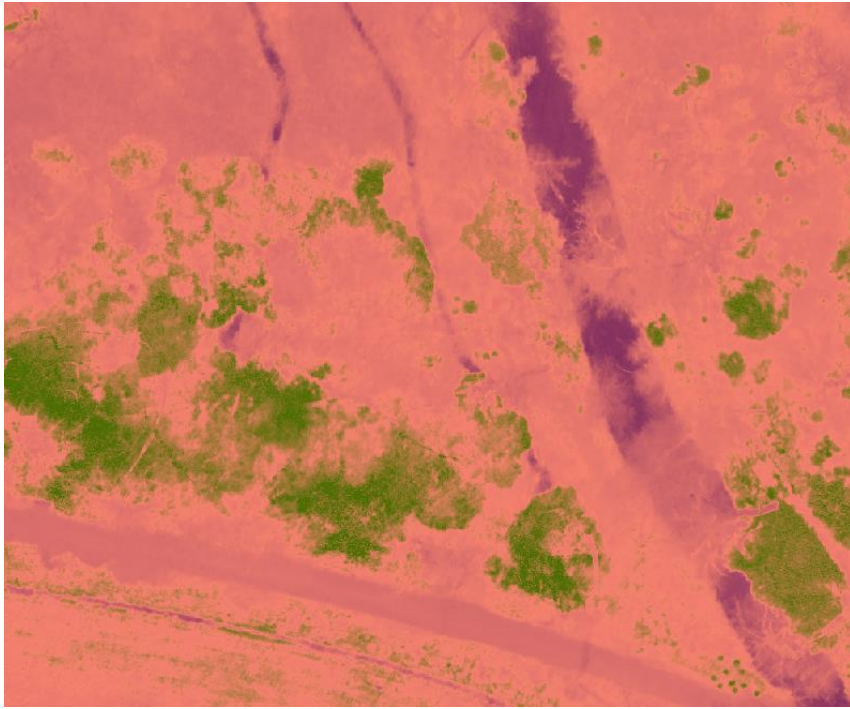


SCP 3CL






NDVI 7CL

Value	Color	Label
-0.44	Dark Blue	Custom color map entry
-0.2	Blue	0.150000
0.1	Red	0.239858
0.21	Orange	0.329716
0.29	Yellow	0.419575
0.35	Light Green	0.509433
0.4	Dark Green	Custom color map entry



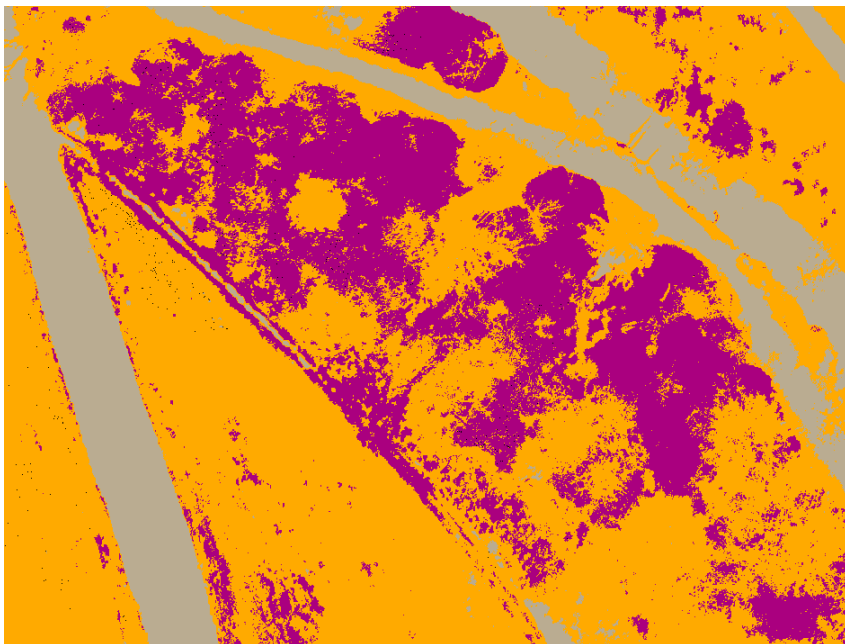
NDVI 3CL

Value	Color	Label
-0.7		Custom color map entry
0.1		0.419575
0.3		Custom color map entry

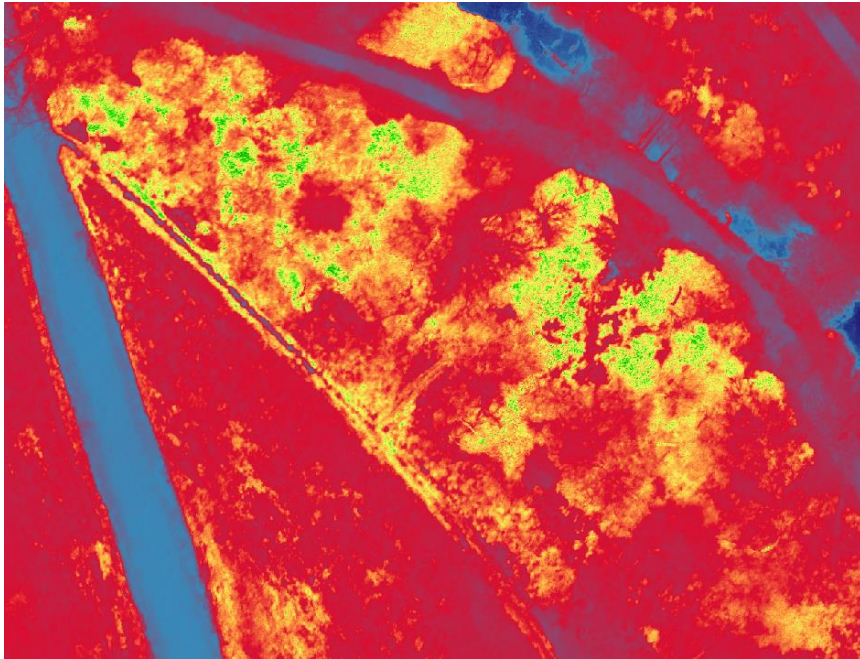
Comparison subset1c (zoomed in at subset 1, F05) NIR-SCP-NDVI



NIR

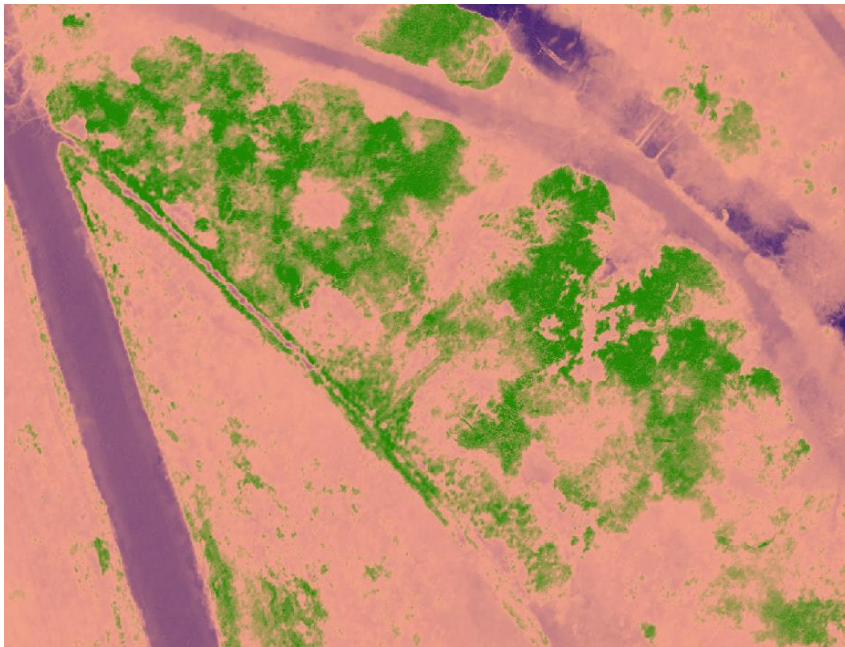


SCP 3CL



NDVI 7CL

Value	Color	Label
-0.44	Dark Blue	Custom color map entry
-0.2	Blue	0.150000
0.1	Red	0.239858
0.21	Orange	0.329716
0.29	Yellow	0.419575
0.35	Light Green	0.509433
0.4	Dark Green	Custom color map entry



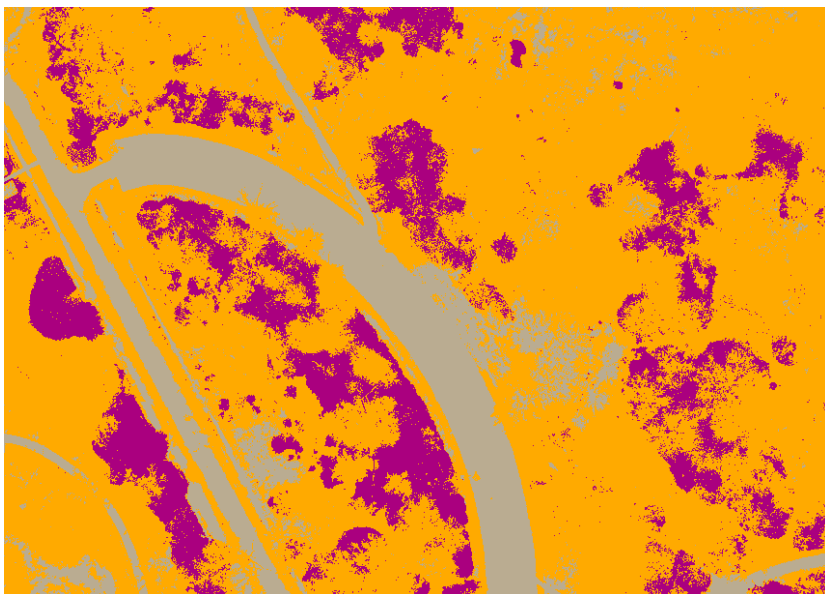
NDVI 3CL

Value	Color	Label
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0.3	Green	Custom color map entry

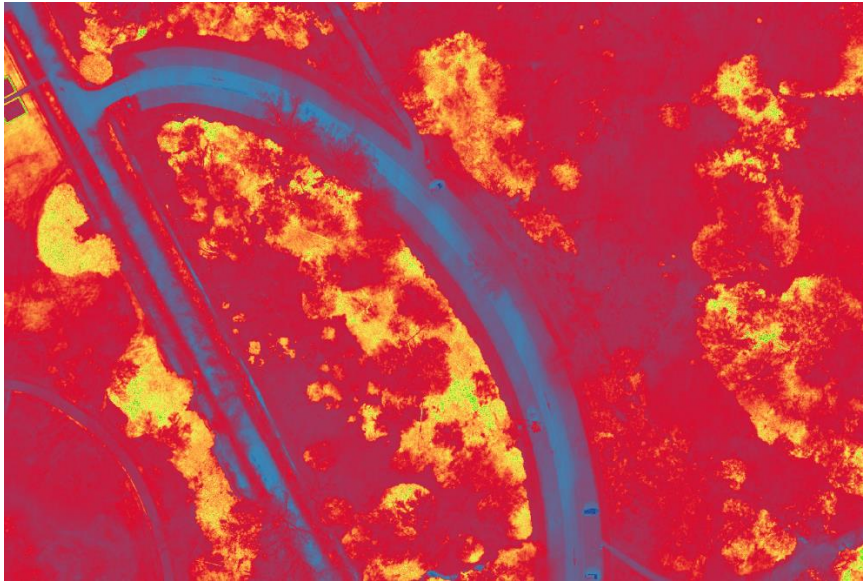
Comparison subset2 (F05): NIR-PCA-SCP-NDVI



NIR

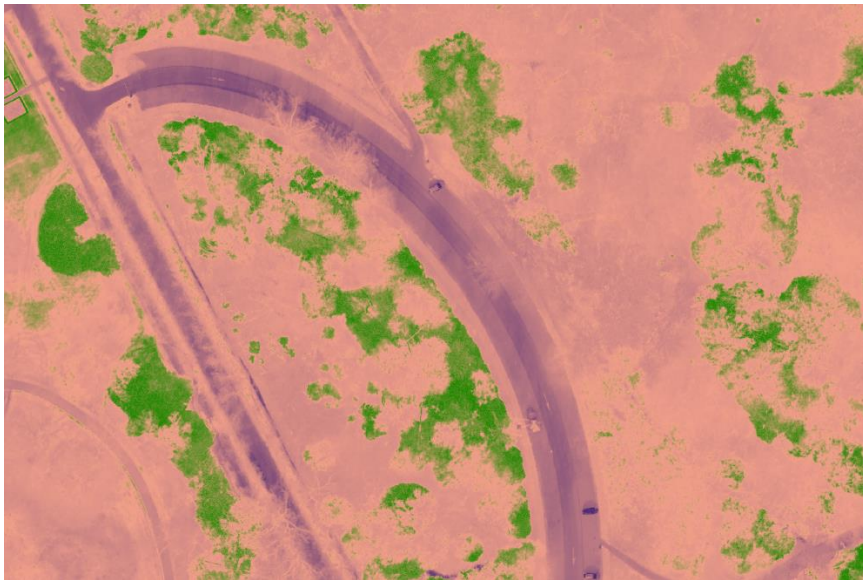


SCP 3CL



NDVI 7CL

Value	Color	Label
-0.7	Dark Blue	Custom color map entry
-0.3	Blue	0.150000
0.1	Red	0.239858
0.21	Orange	0.329716
0.29	Yellow	0.419575
0.35	Light Green	0.509433
0.4	Dark Green	Custom color map entry



NDVI 3CL

Value	Color	Label
-0.7	Dark Blue	Custom color map entry
0.1	Light Brown	0.419575
0.3	Dark Green	Custom color map entry