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Drone and sentinel-2 data application for mapping of mowing effects on reed stands in the Plateliai lake (Lithuania)



Actuality

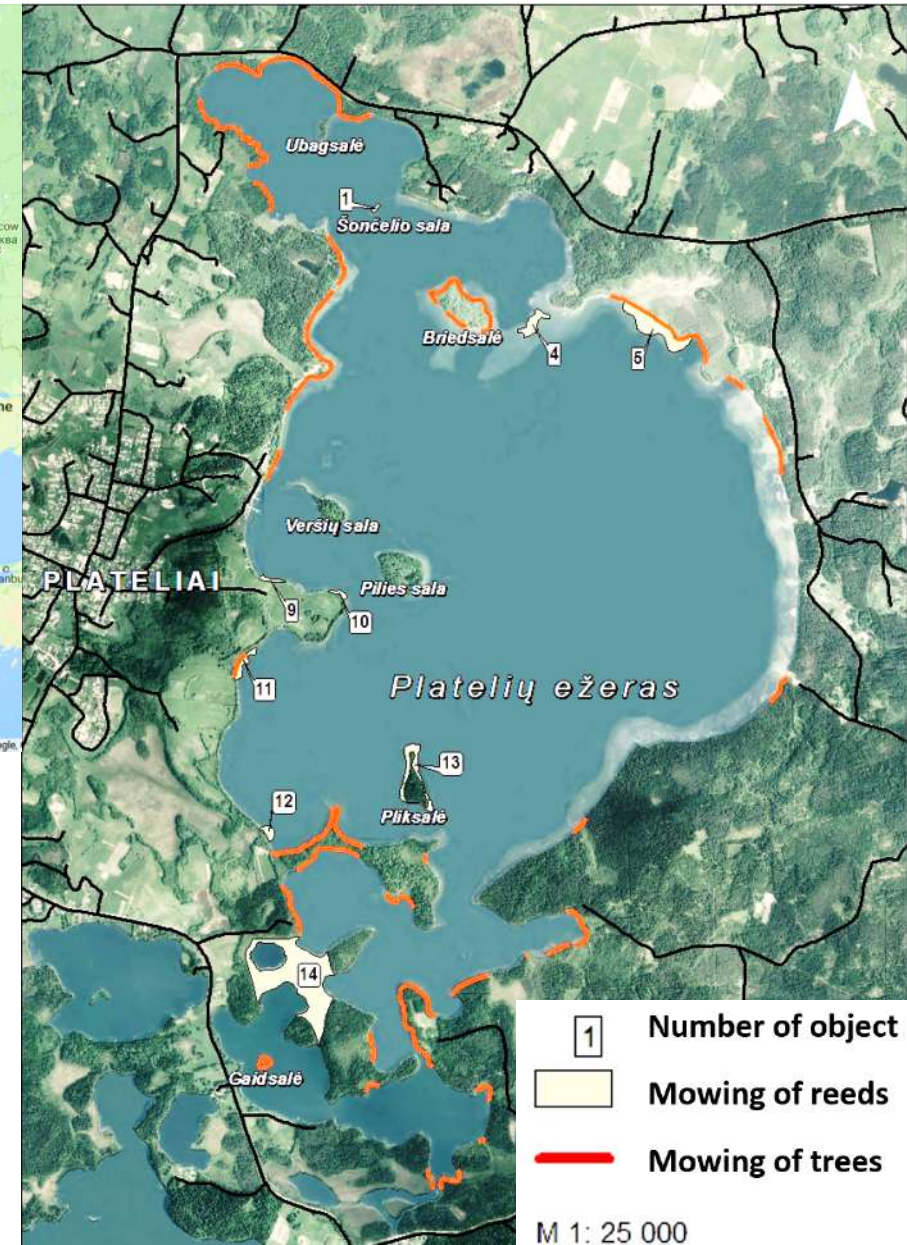
common reed (*Phragmites australis*)

- Spawning and nursery areas for commercial fishes
- Habitats for birds and invertebrates
- Protection of coastal erosion
- Sink of carbon and nutrients
- Construction material
- One of biological quality element for assessment ecological status of waterbodies according to the Water Framework Directive



Characteristics of Plateliai lake

Surface area	12 km ²
Islands	7
Max. depth	49 m
Mean depth	10 m
Chlorophyll-a	4 µg l ⁻¹
Secchi depth	6 m



Aim

to detect changes in the reed stands after their mowing in the scale of Plateliai lake using drone and Sentinel-2

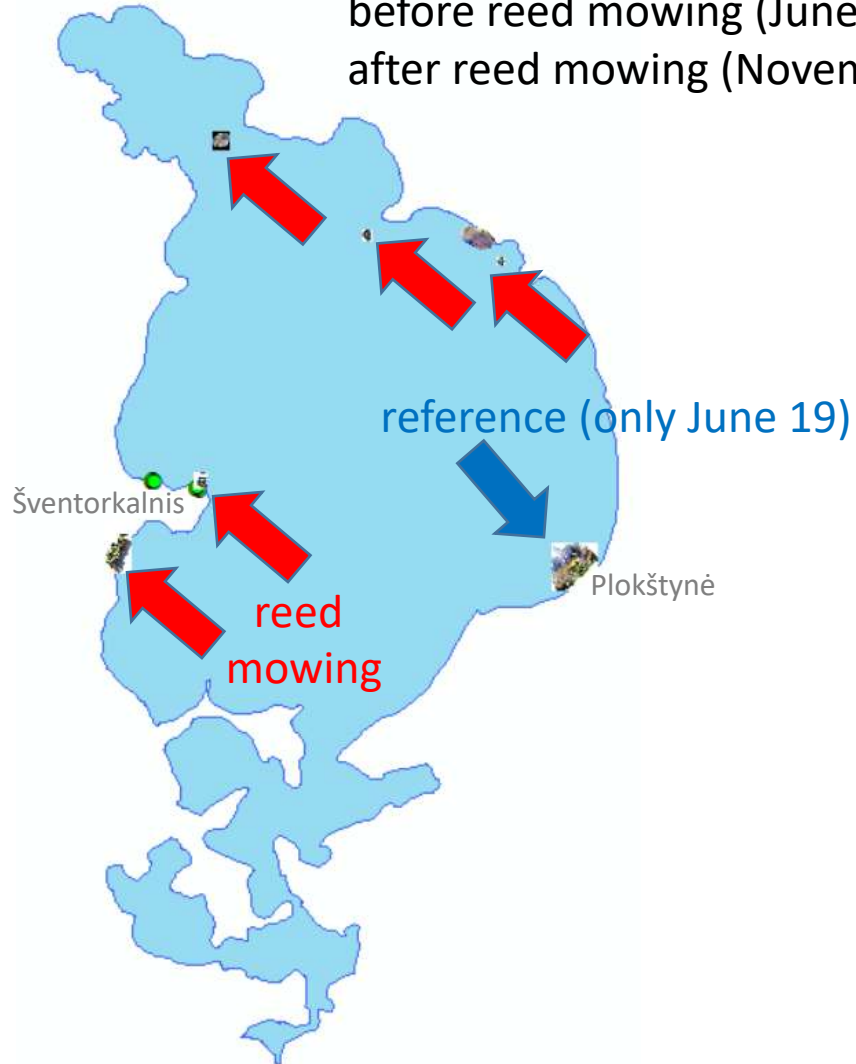
Questions:

1. What flight altitude is better for mapping of reeds and other macrophyte stands?
2. What parameters delineated from drone image are useful for detection of mowing effect?
3. Are Sentinel-2 images sufficient to assess human impact on reeds?

Methods

Study areas by drone

Mapping 2 times:
before reed mowing (June 19 2018)
after reed mowing (November 08 2018)



DJI Phantom 4 advanced

Total mapped area ~ 12 ha

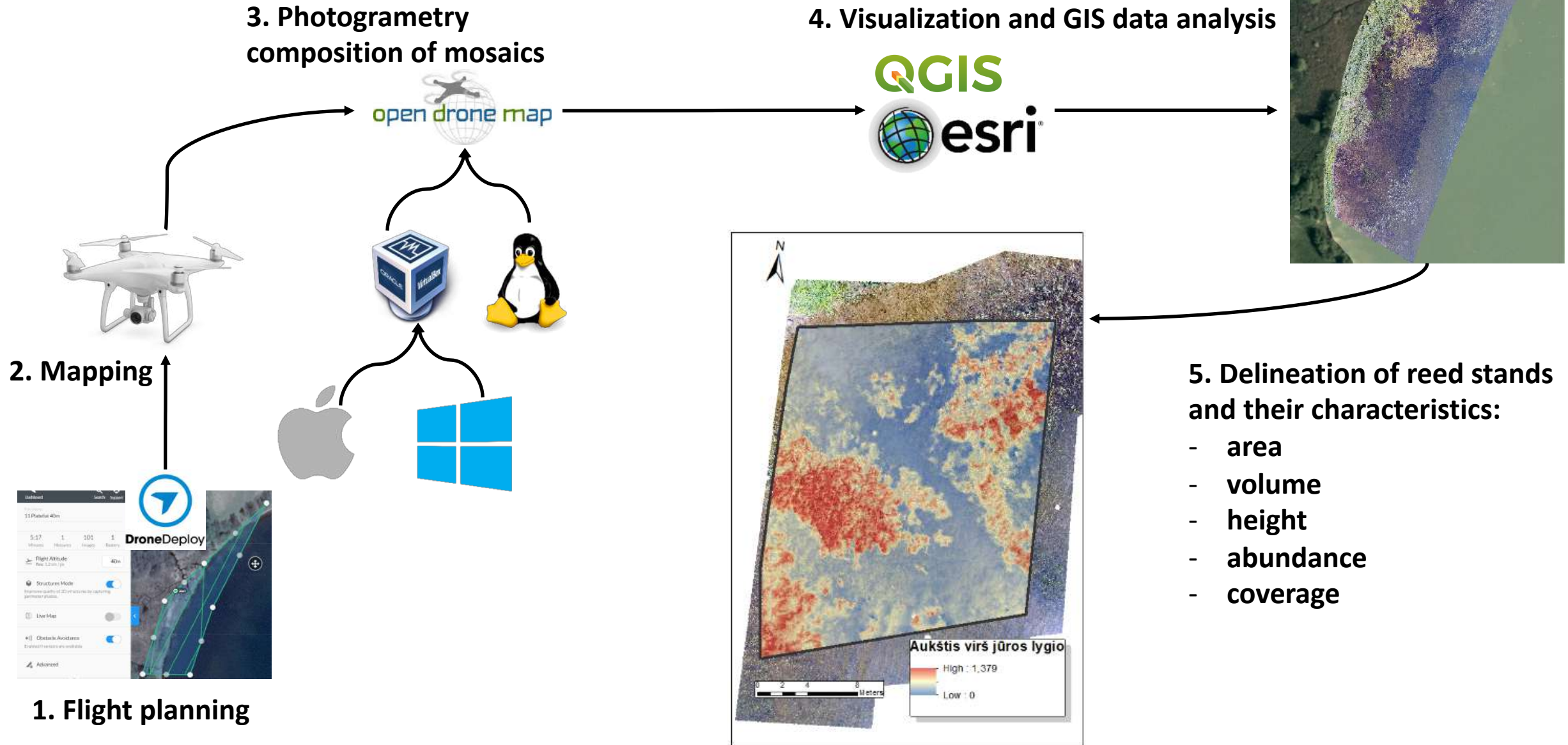
Altitude: 10 – 70 m



Leica 1200 smart rover

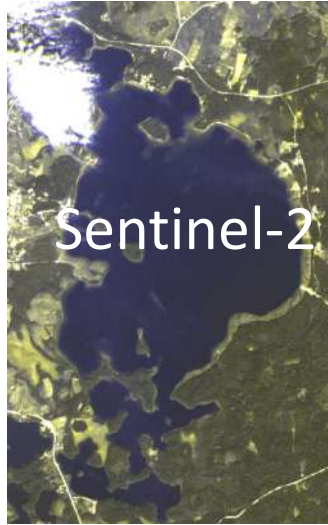
Methods

Work flow for drone



Methods

Work flow for Sentinel-2

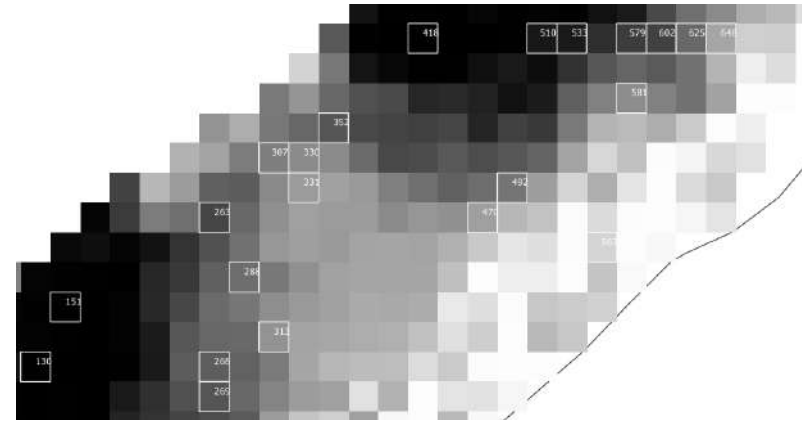


→ Sen2Cor atmospheric correction algorithm

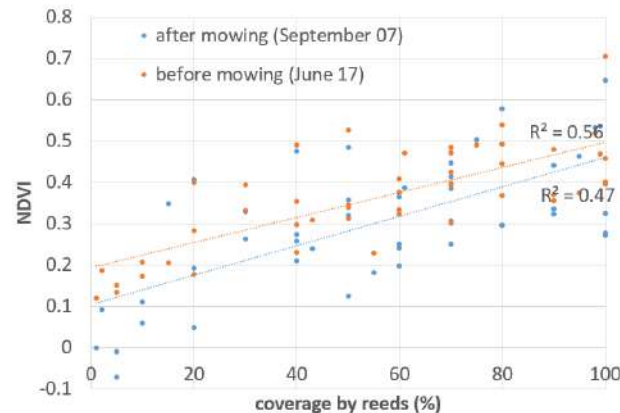
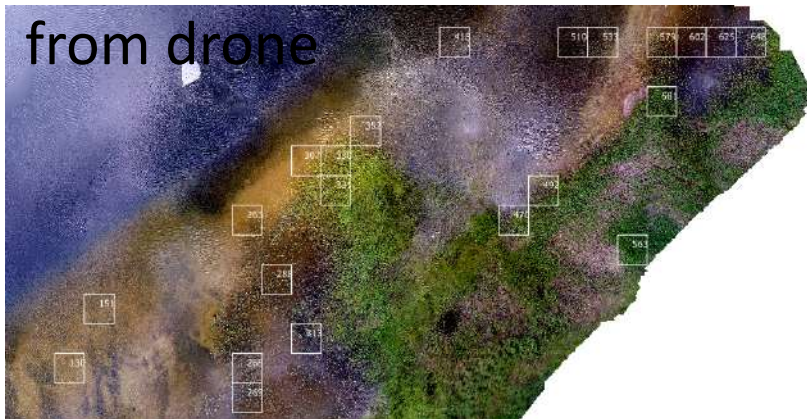


Normalized Difference Vegetation Index - NDVI

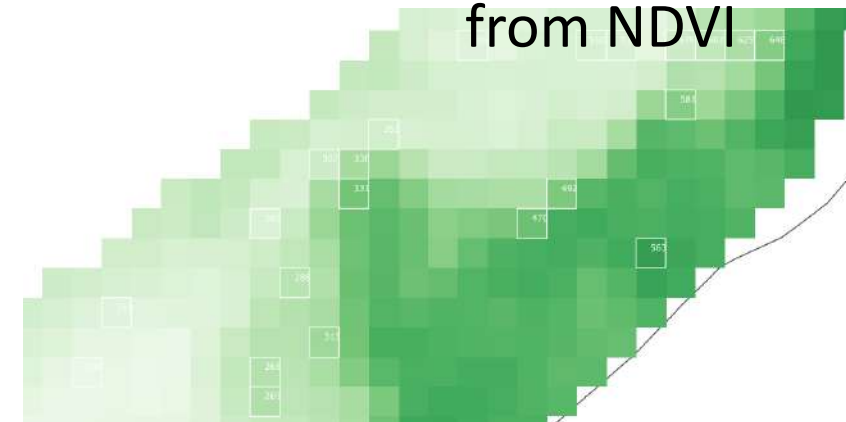
$$= \frac{\text{Band 8} - \text{Band 4}}{\text{Band 8} + \text{Band 4}}$$



coverage of reeds (%)
from drone

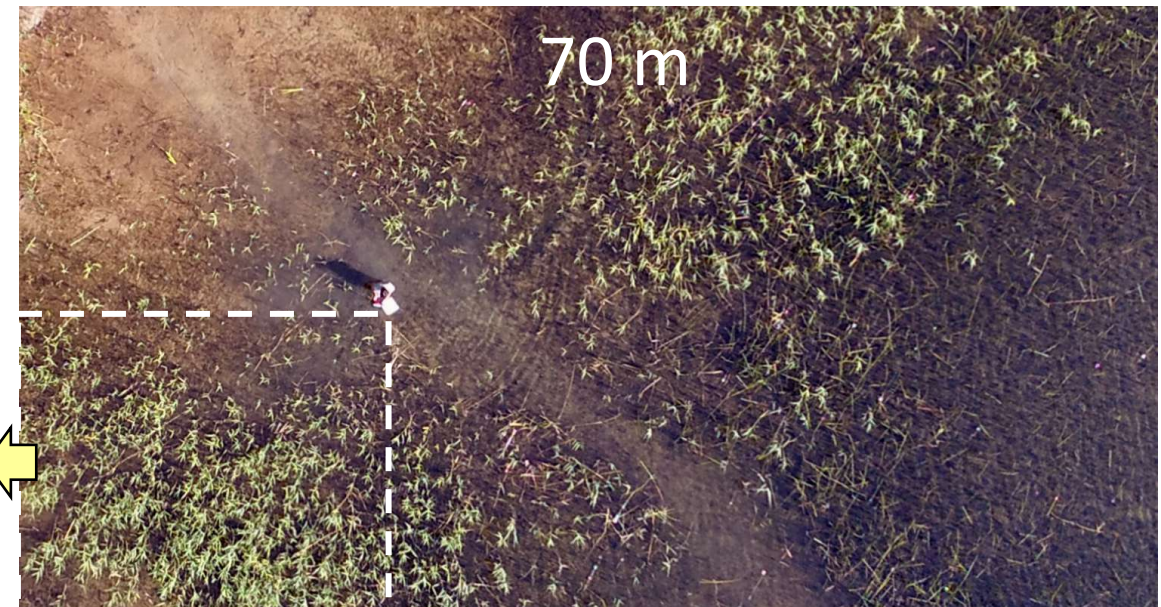
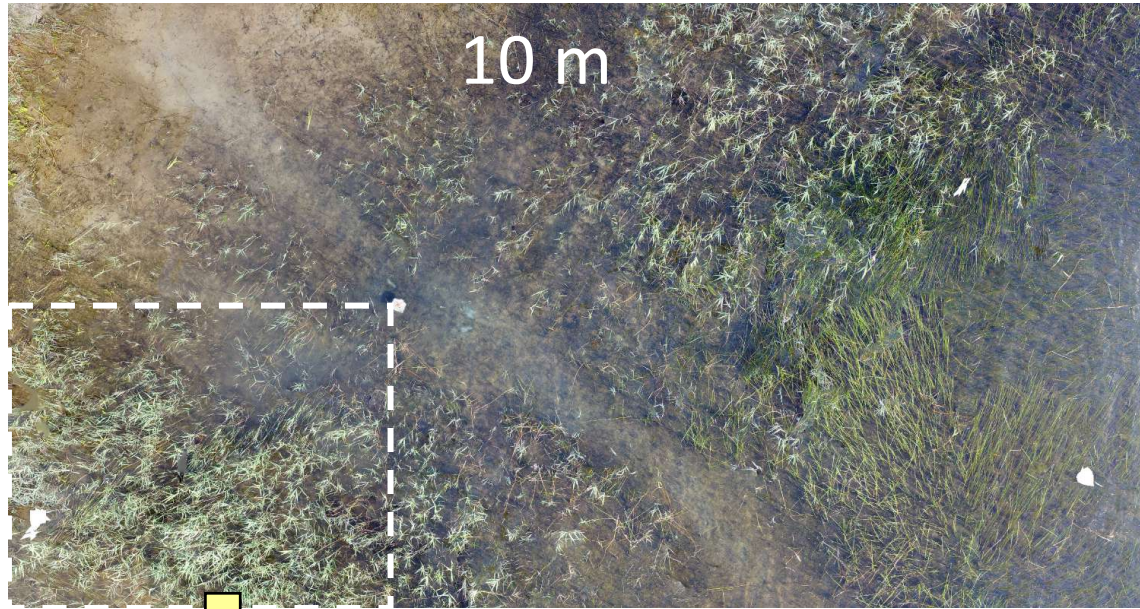


coverage of reeds (%)
from NDVI



RESULTS

Reed stands from different altitude



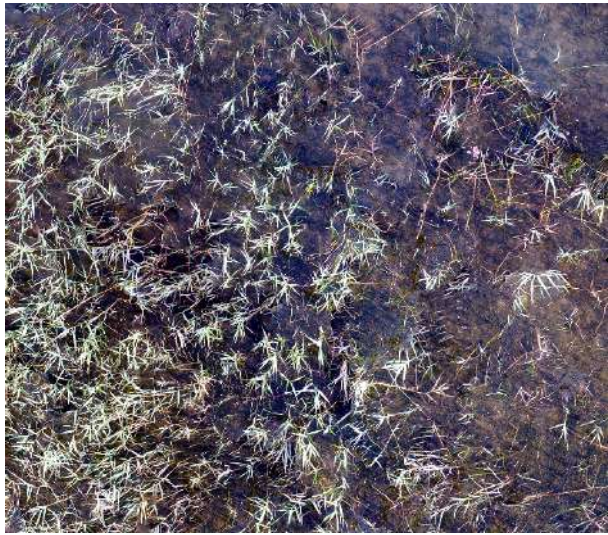
RESULTS

Macrophyte diversity

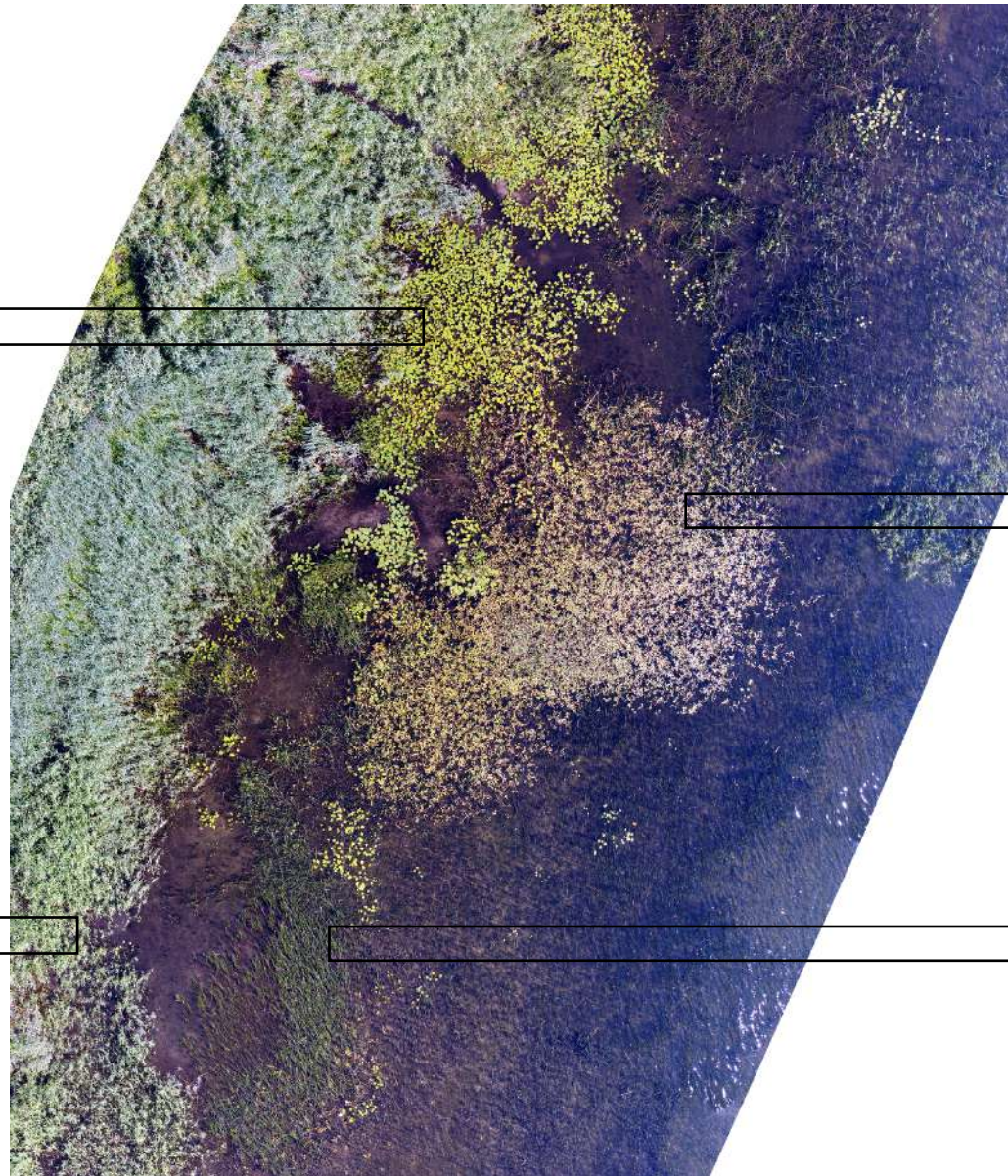
yellow water-lily (*Nuphar lutea*)



common reed (*Phragmites australis*)



lakeshore bulrush
(*Schoenoplectus lacustris*)



RESULTS

Macrophyte diversity

shining pondweed (*Potamogeton lucens*)

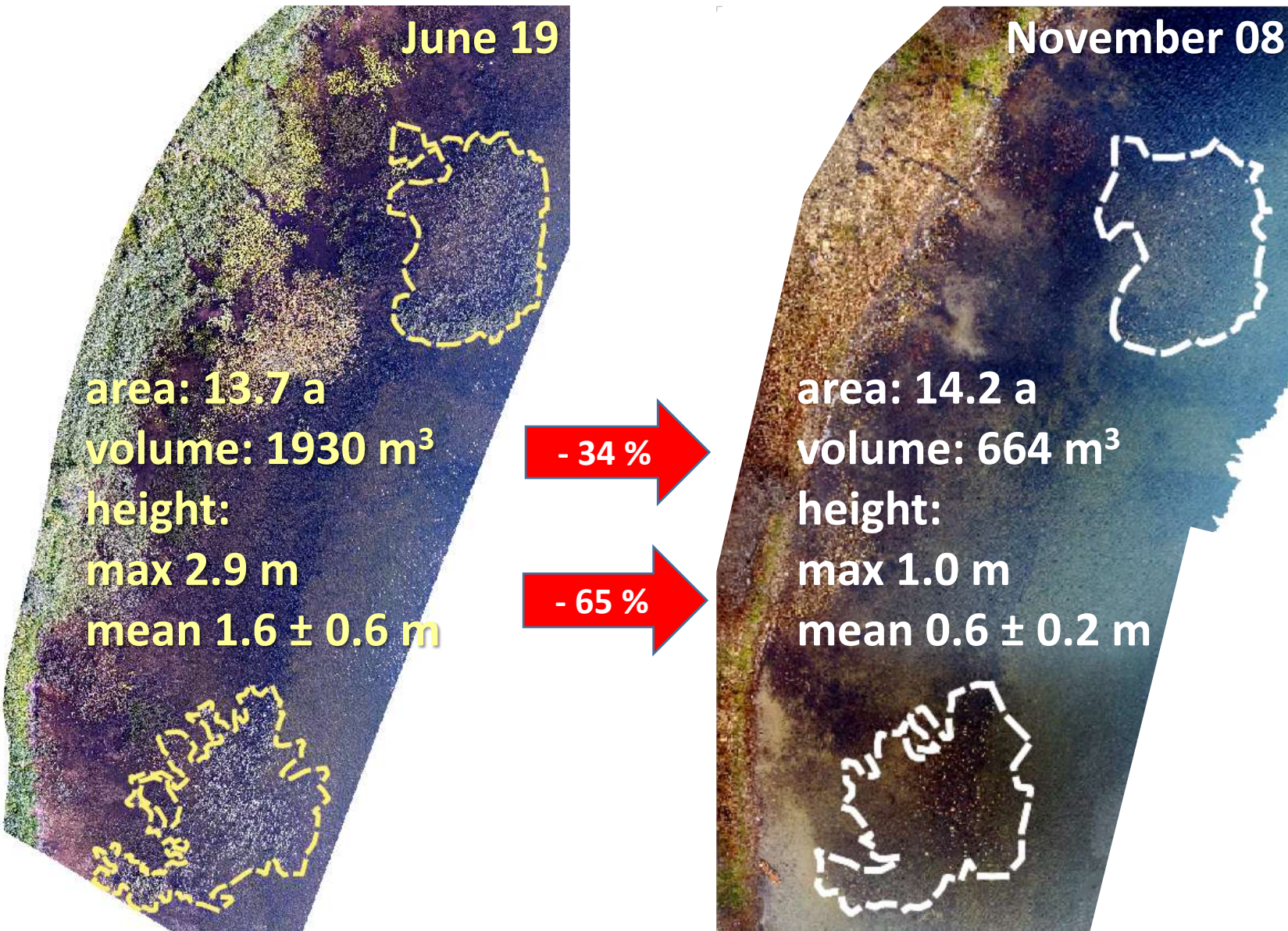


claspingleaf pondweed (*Potamogeton perfoliatus*)



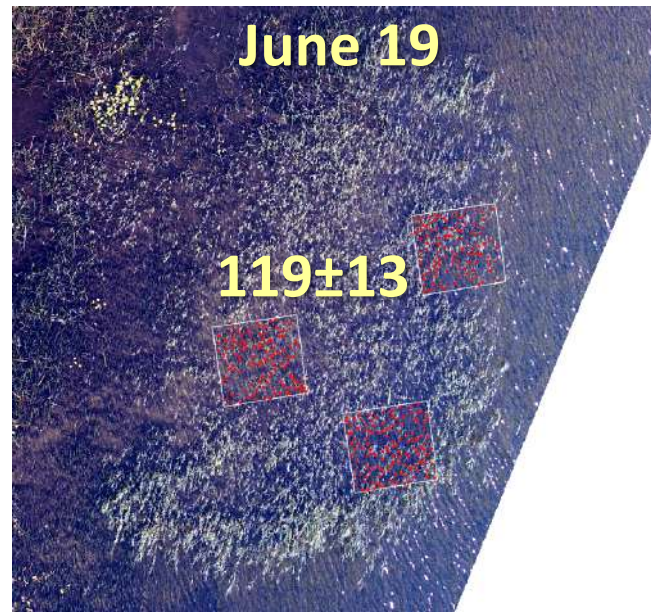
RESULTS

Changes in reed stands

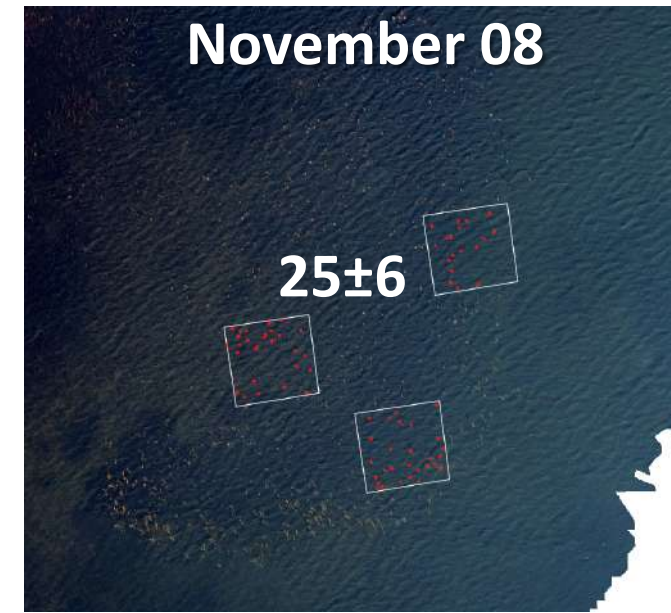


RESULTS

Changes in reed stands



- 21 %

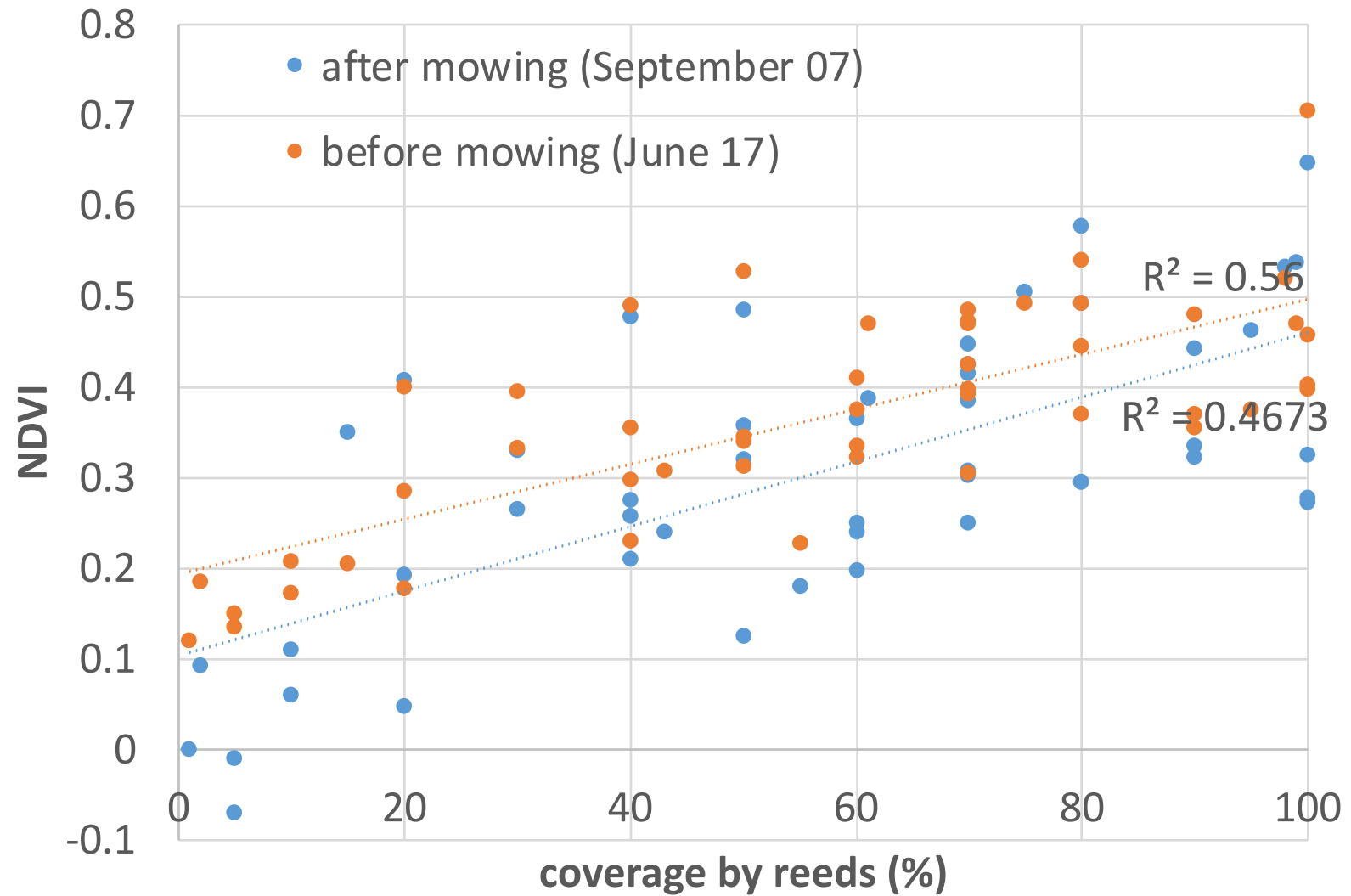


- 46 %



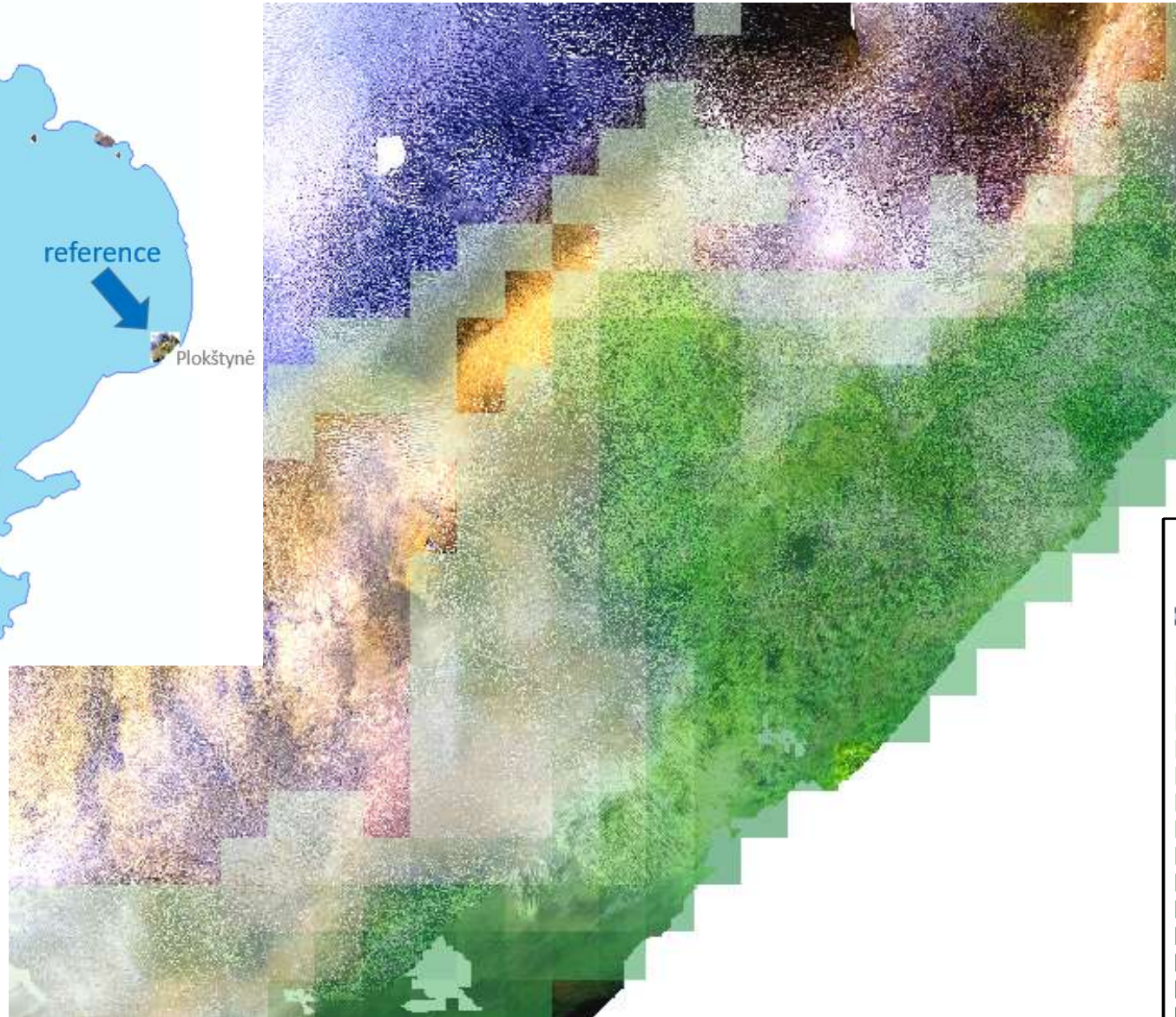
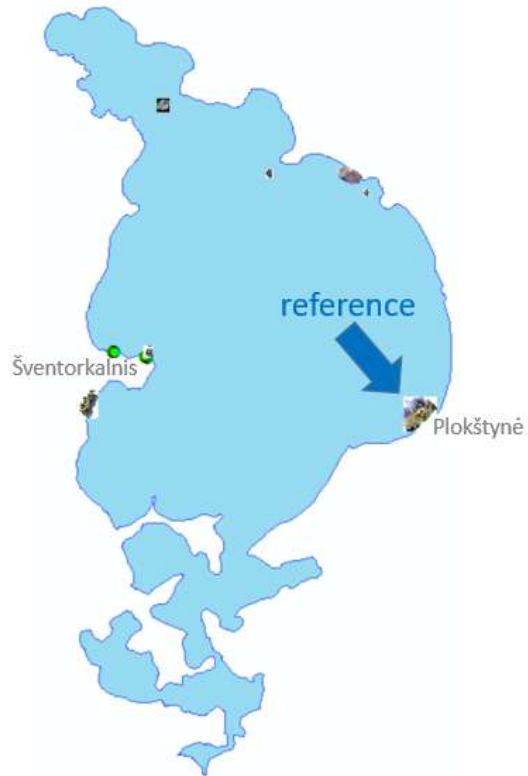
RESULTS

Relationship between NDVI and reed cover



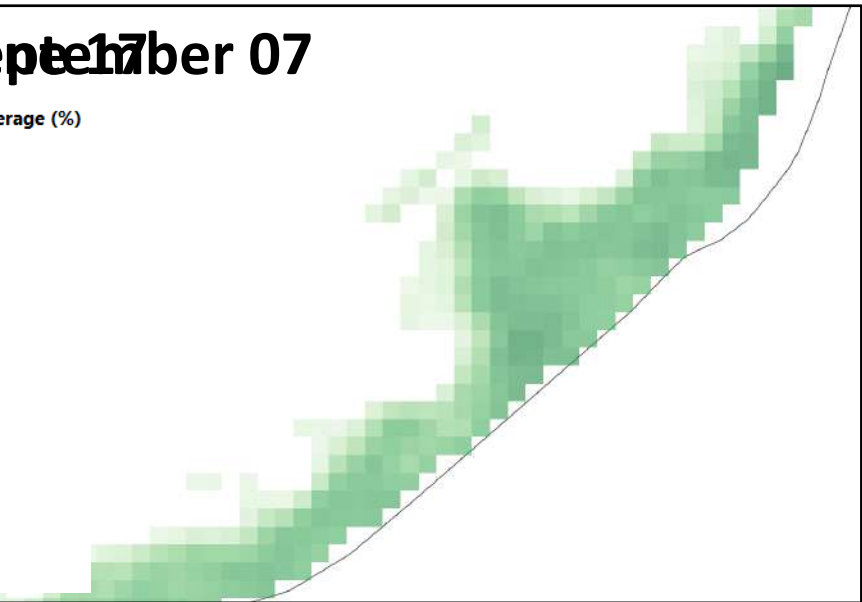
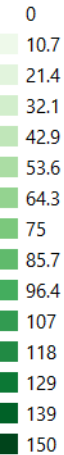
RESULTS

Reed cover from Sentinel-2



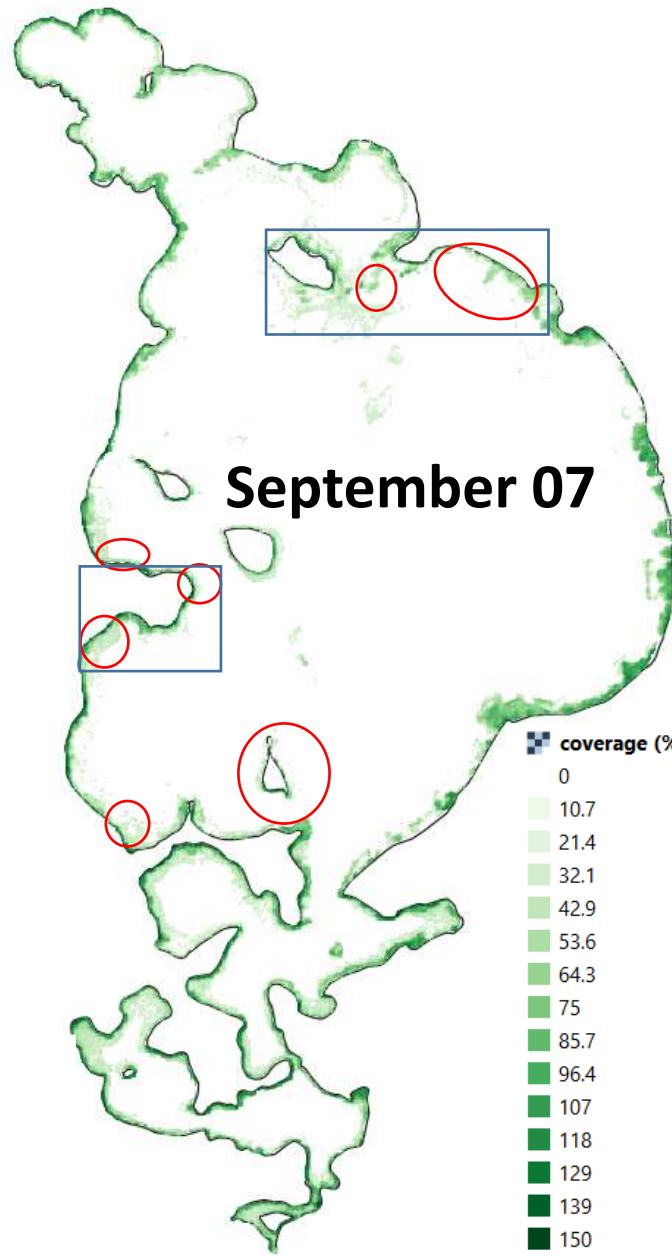
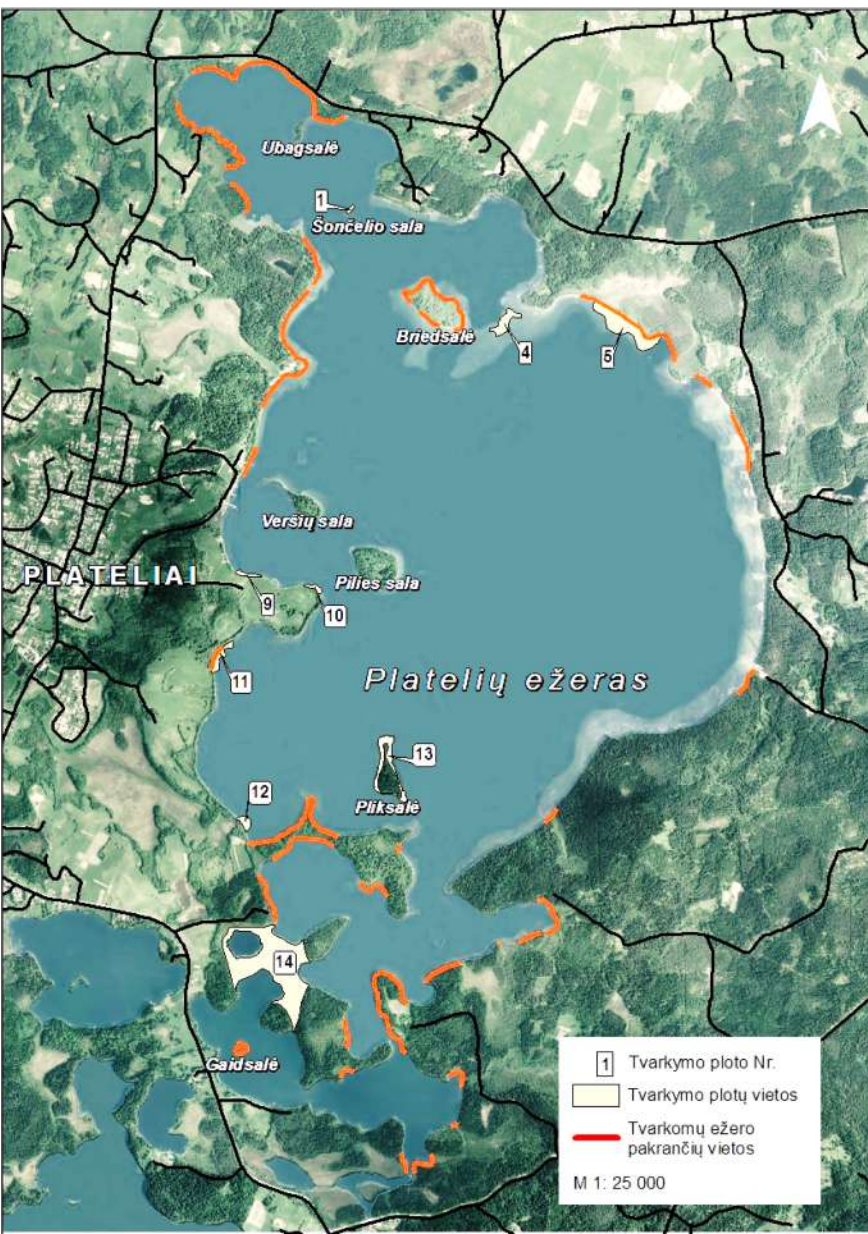
September 07

coverage (%)

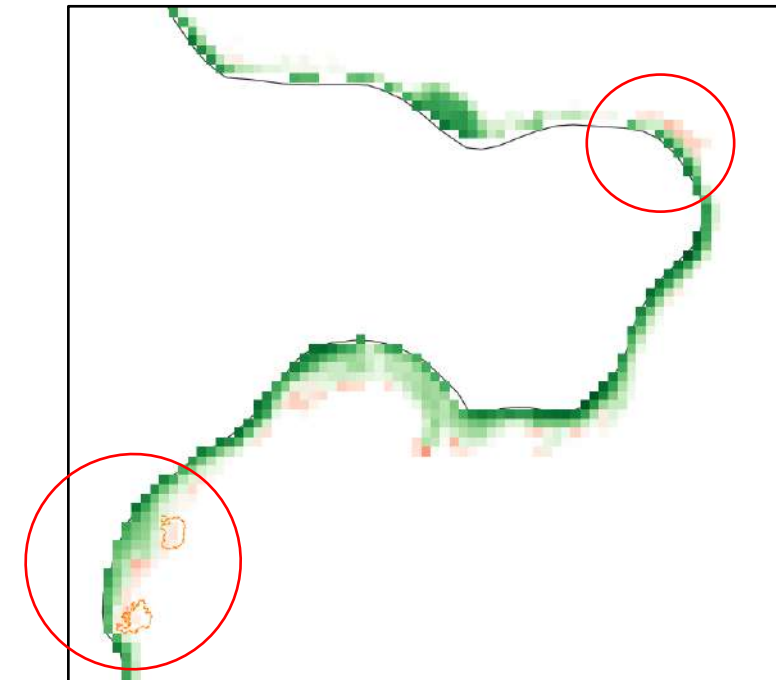


RESULTS

Reed cover from Sentinel-2



reed stands of > 50 % cover



Messages

- 70 m altitude of flight was sufficient for mapping of reeds and other macrophyte stands.
- From drone images, significant changes in the reeds stands (volume, density and height) were recorded in the mowed areas.
- Drone and Sentinel-2 images show potential in use for monitoring the status of reeds.
- Satellite derived data allows to select the densest reed stands for the sustainable lake management.

Acknowledgement



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EOMORES

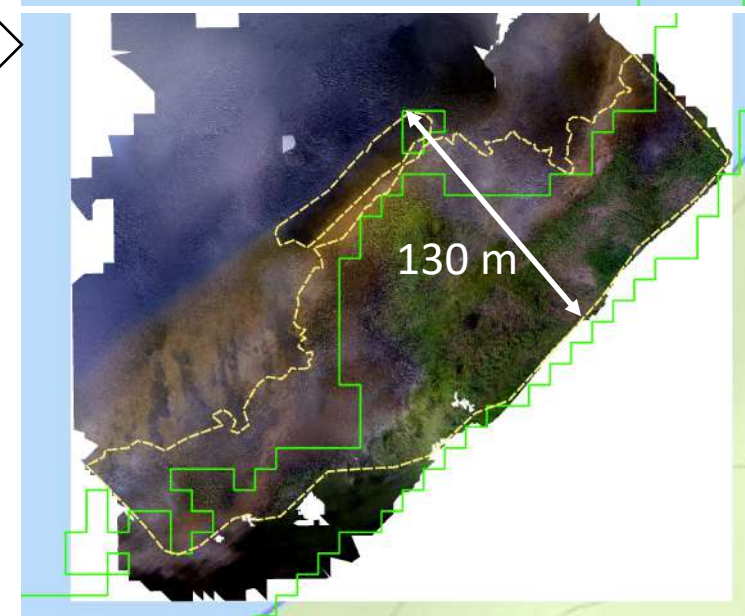
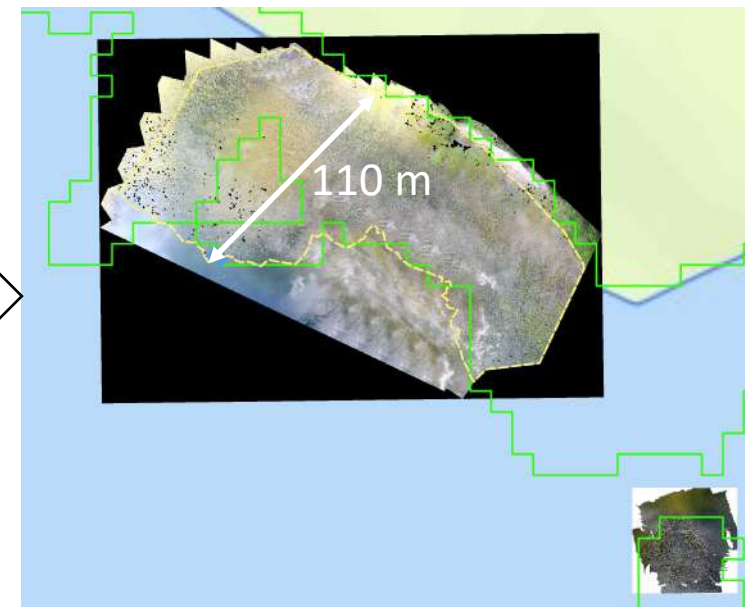
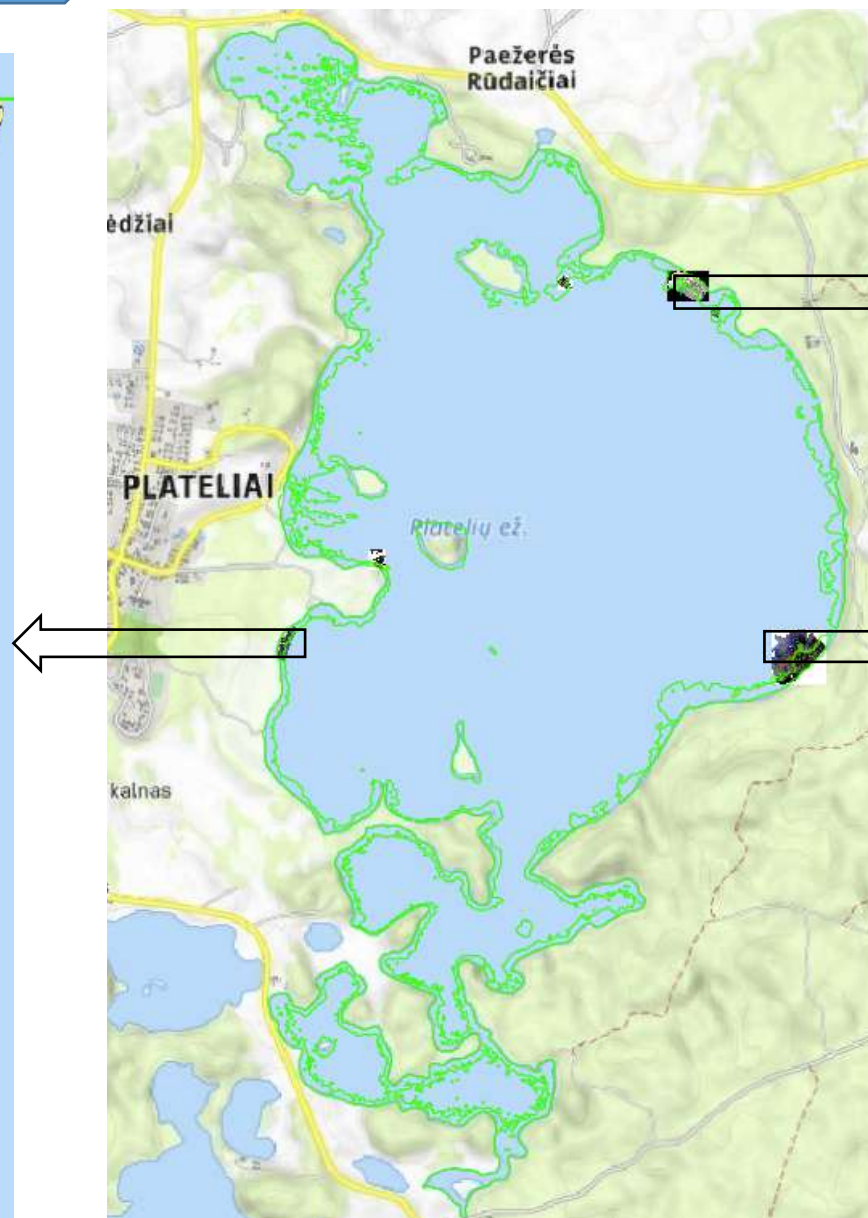
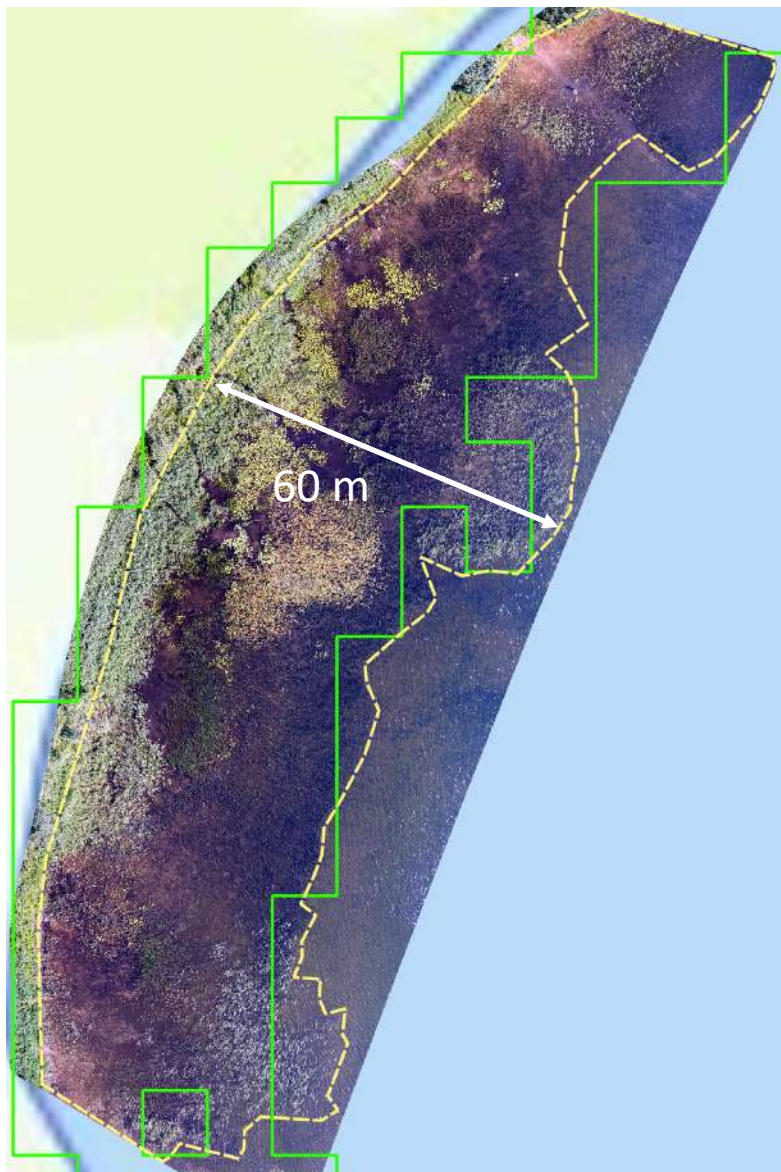
Horizon 2020 research and innovation
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Jonas Gintauskas

RESULTS

Drone vs. Sentinel-2



REZULTATAI

Vaizdo kokybė ir plotas

