LiDAR and its applications

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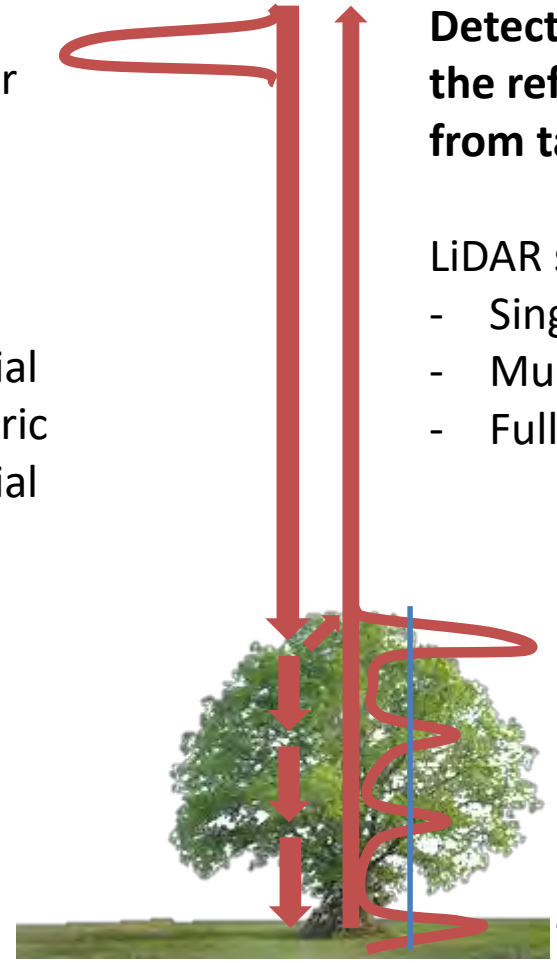
Light Detection And Ranging

Light (Laser) pulse
as an information carrier

Most common wavelengths:
- 1064 nm for terrestrial
- 532 nm for bathimetric
- 1550 nm for terrestrial

LRR 10...300 kHz



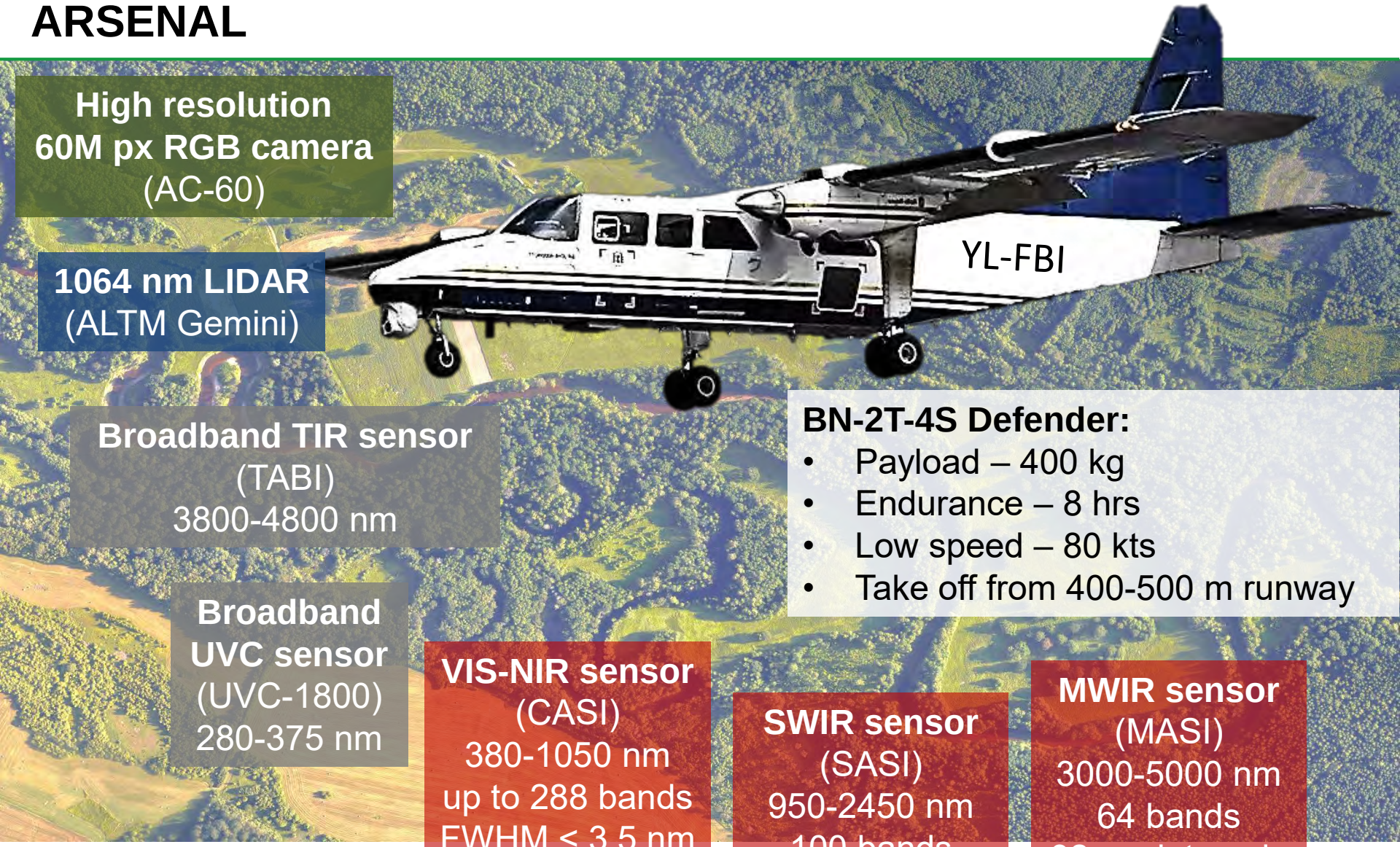
Detection of the reflected signal from target

LiDAR systems:
- Single return
- Multiple returns
- Full wave form

Range to target calculation

Range = c*t/2

Airborne Surveillance and Environmental Monitoring System ARSENAL



High resolution 60M px RGB camera (AC-60)

1064 nm LIDAR (ALTM Gemini)

Broadband TIR sensor (TABI) 3800-4800 nm

Broadband UVC sensor (UVC-1800) 280-375 nm

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SWIR sensor (SASI) 950-2450 nm 100 bands 15 nm intervals

MWIR sensor (MASI) 3000-5000 nm 64 bands 32 nm intervals

BN-2T-4S Defender:

- Payload – 400 kg
- Endurance – 8 hrs
- Low speed – 80 kts
- Take off from 400-500 m runway

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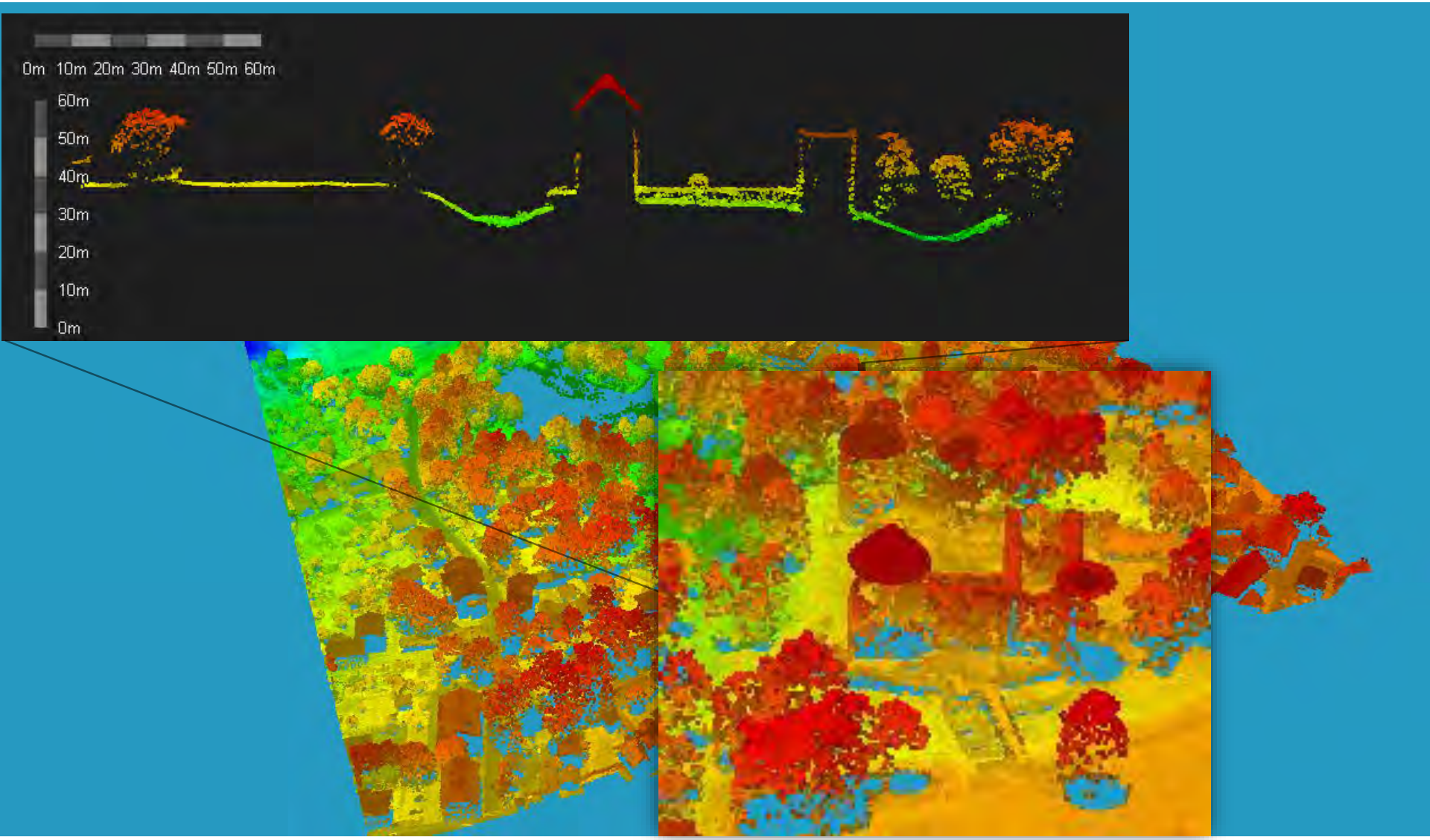
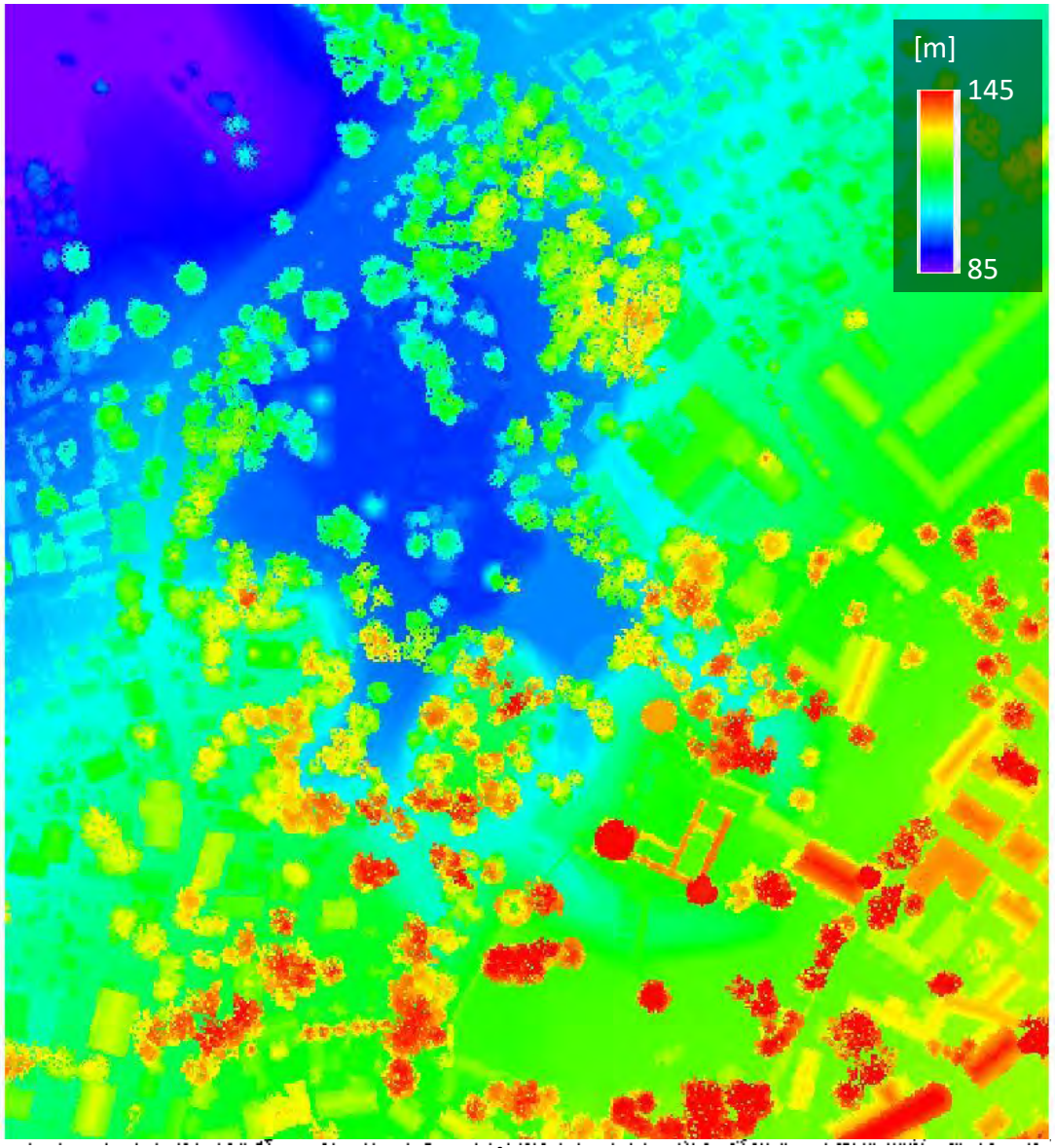
Aerial photography of the center of Cesis

LiDAR point cloud



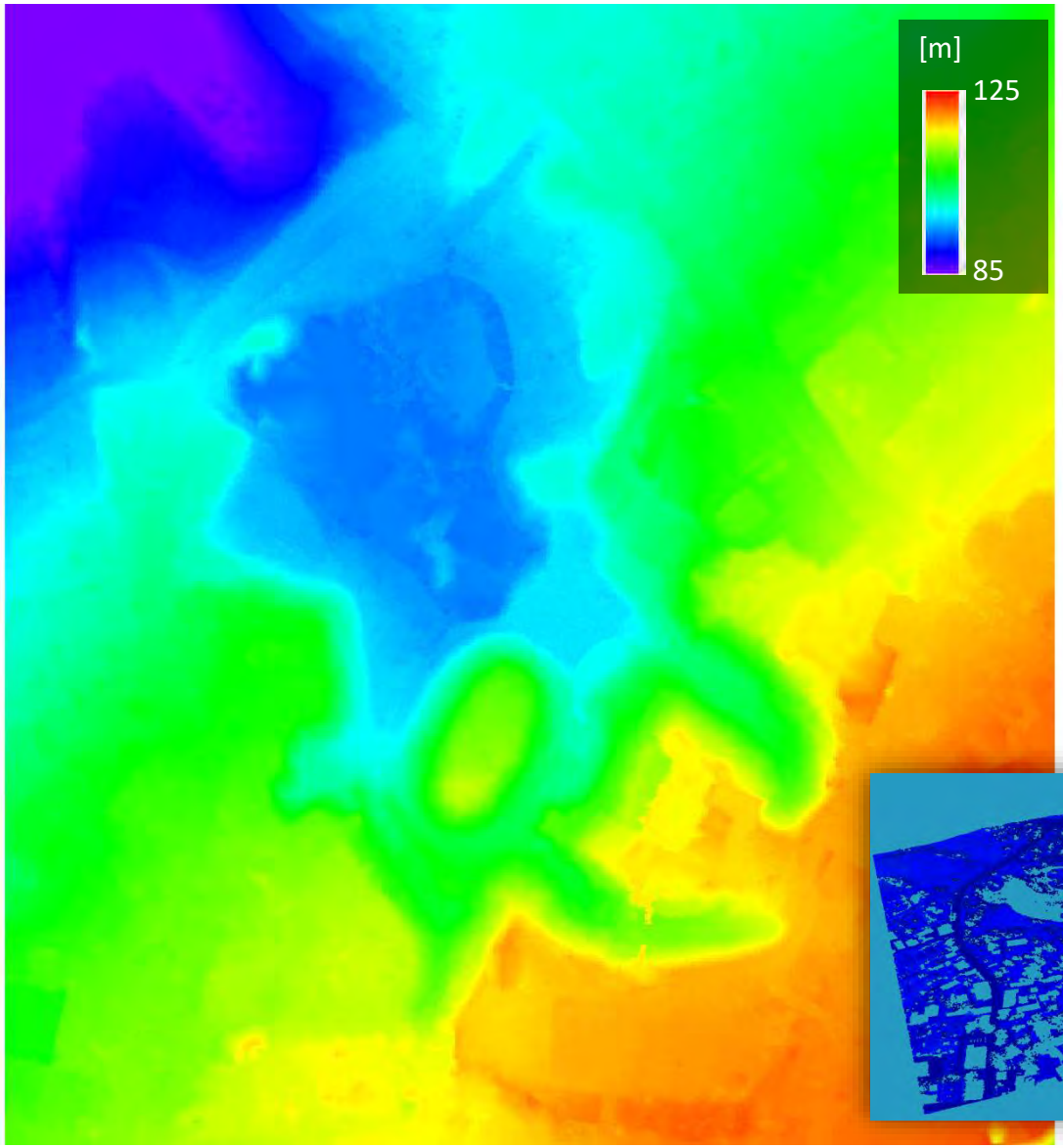
Lidar data set consists of 1M returns covering 520x480 m area.
Elevation of points (returns) varies from 78...160 m.

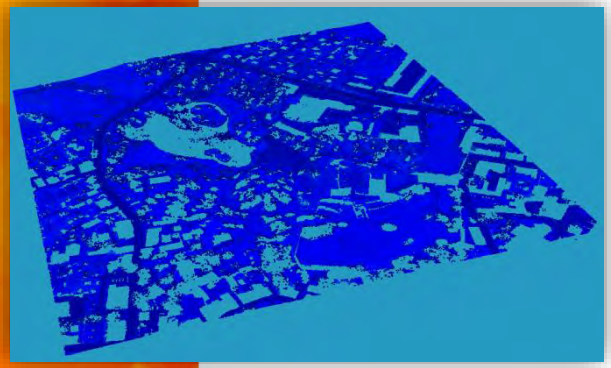
Digital Surface Model (DSM)



Points are converted into raster with 1m/px spatial resolution.
4% of DSM pixels (mostly water pixels in the pond) were filled by interpolation.

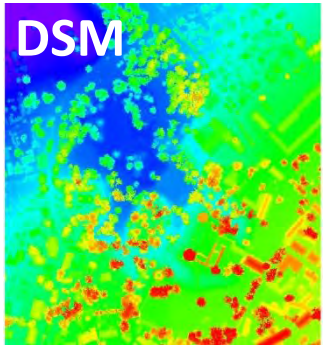
Digital Terrain Model (DTM)

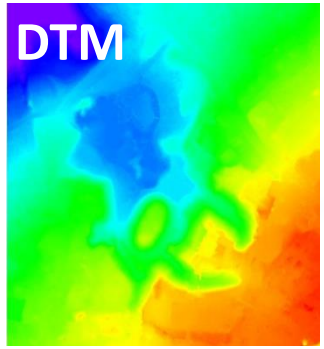


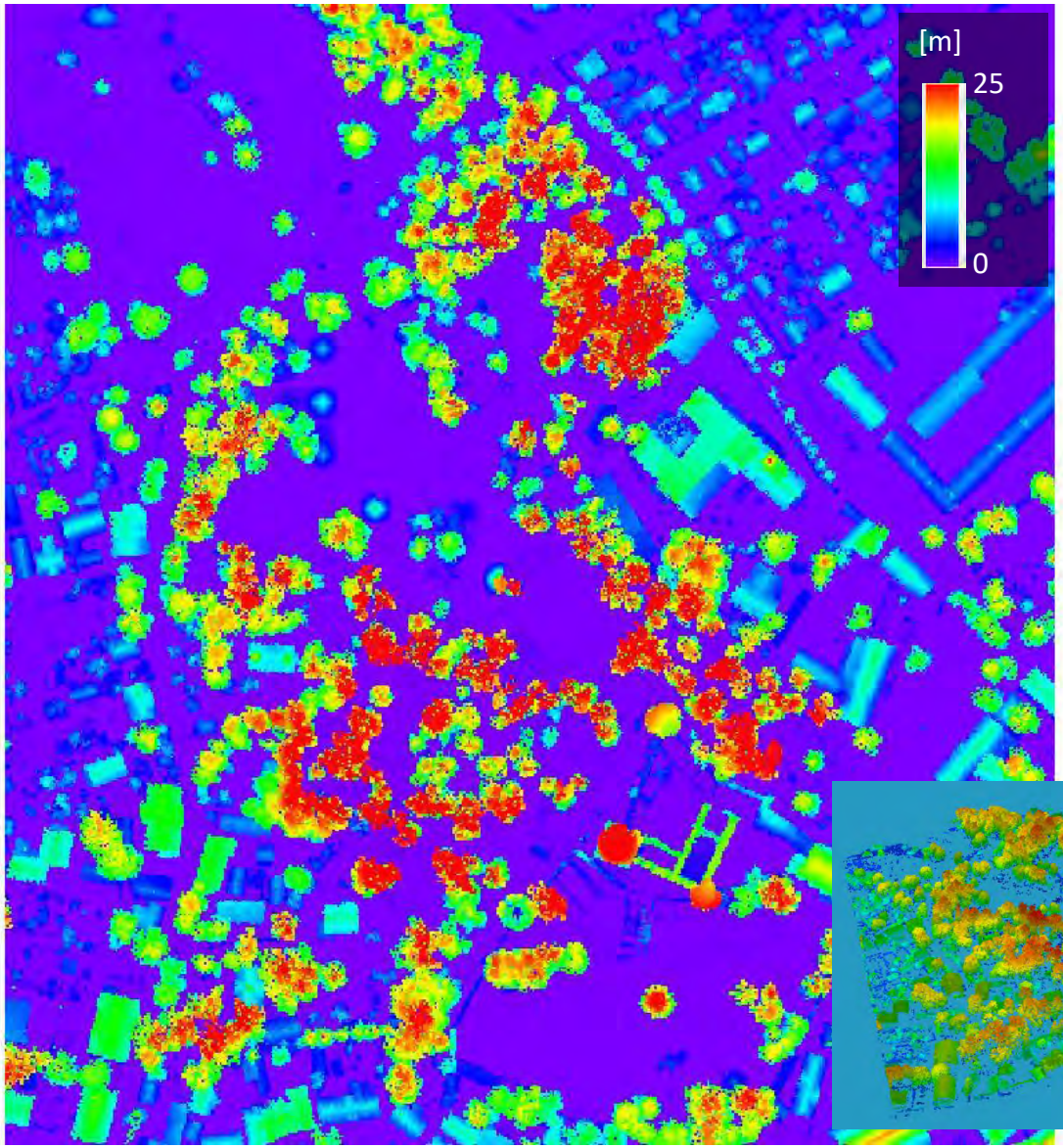


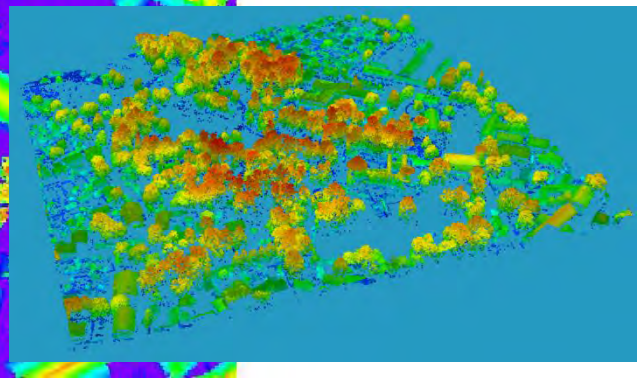
DTM is produced using 19% of points representing terrain (relief).

Normalized Digital Surface Model (NDSM)



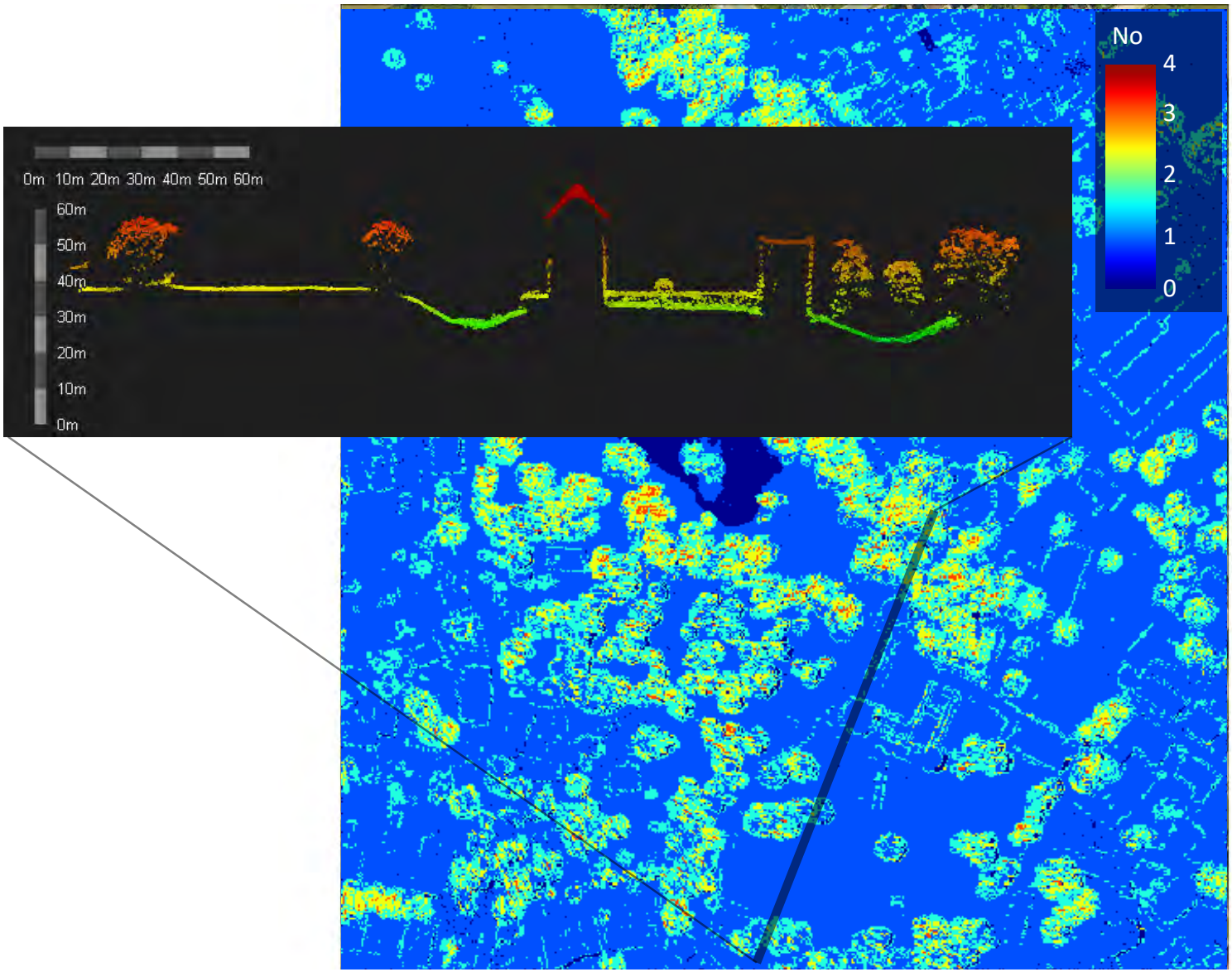






Normalized Digital Surface Model (NDSM) is obtained substracting DTM from DSM. NDSM could be called Canopy Height Model (CHM) if buildings are filtered out.

Multiple returns



Appearance of multiple returns – 2nd return 21,5%, 3rd return 3,6% and 4th return 0,3%.

LiDAR intensity image at 1064 nm

Sun relfected light intensity image at 1043 nm

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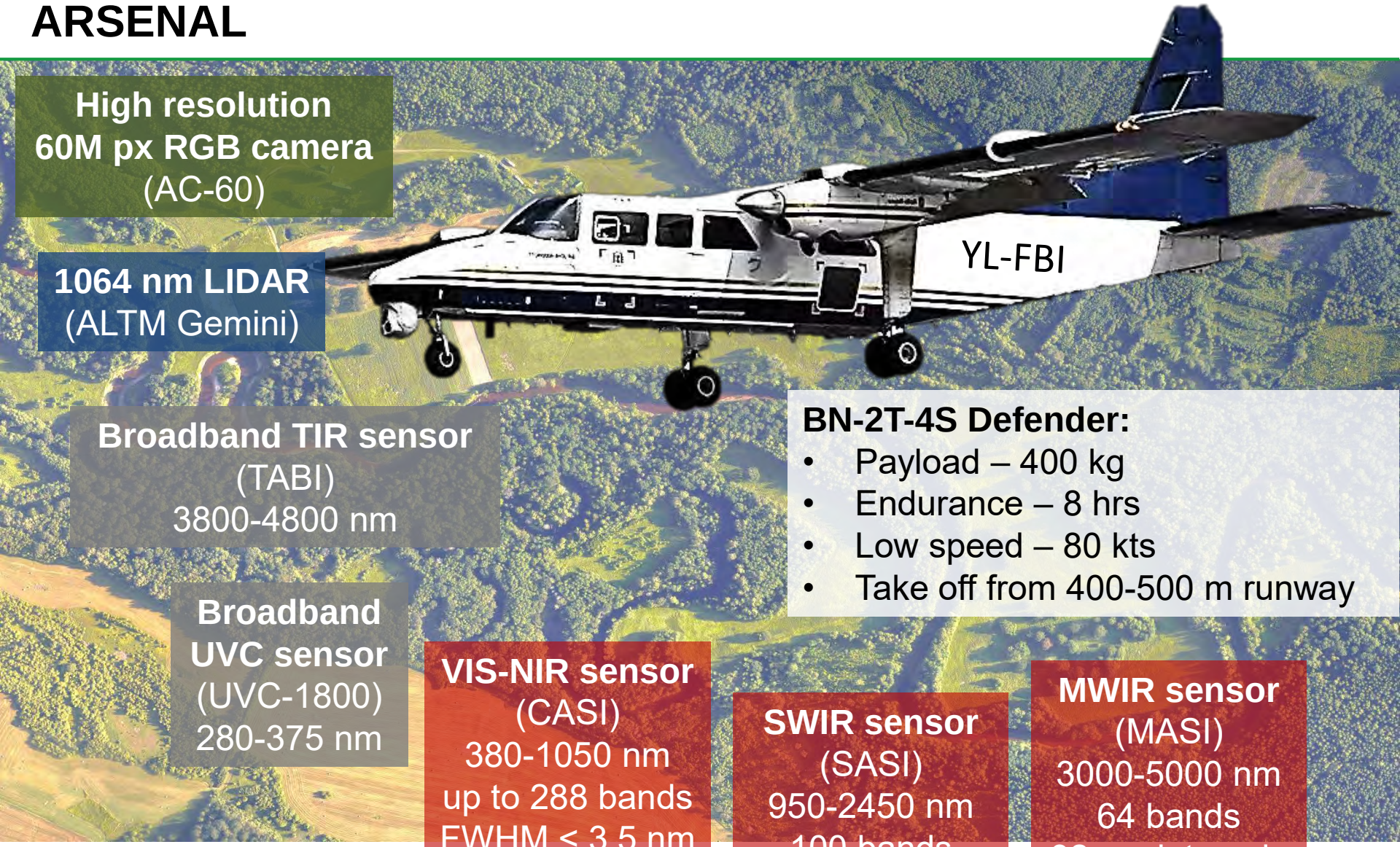
Airborne Surveillance and Environmental Monitoring System ARSENAL



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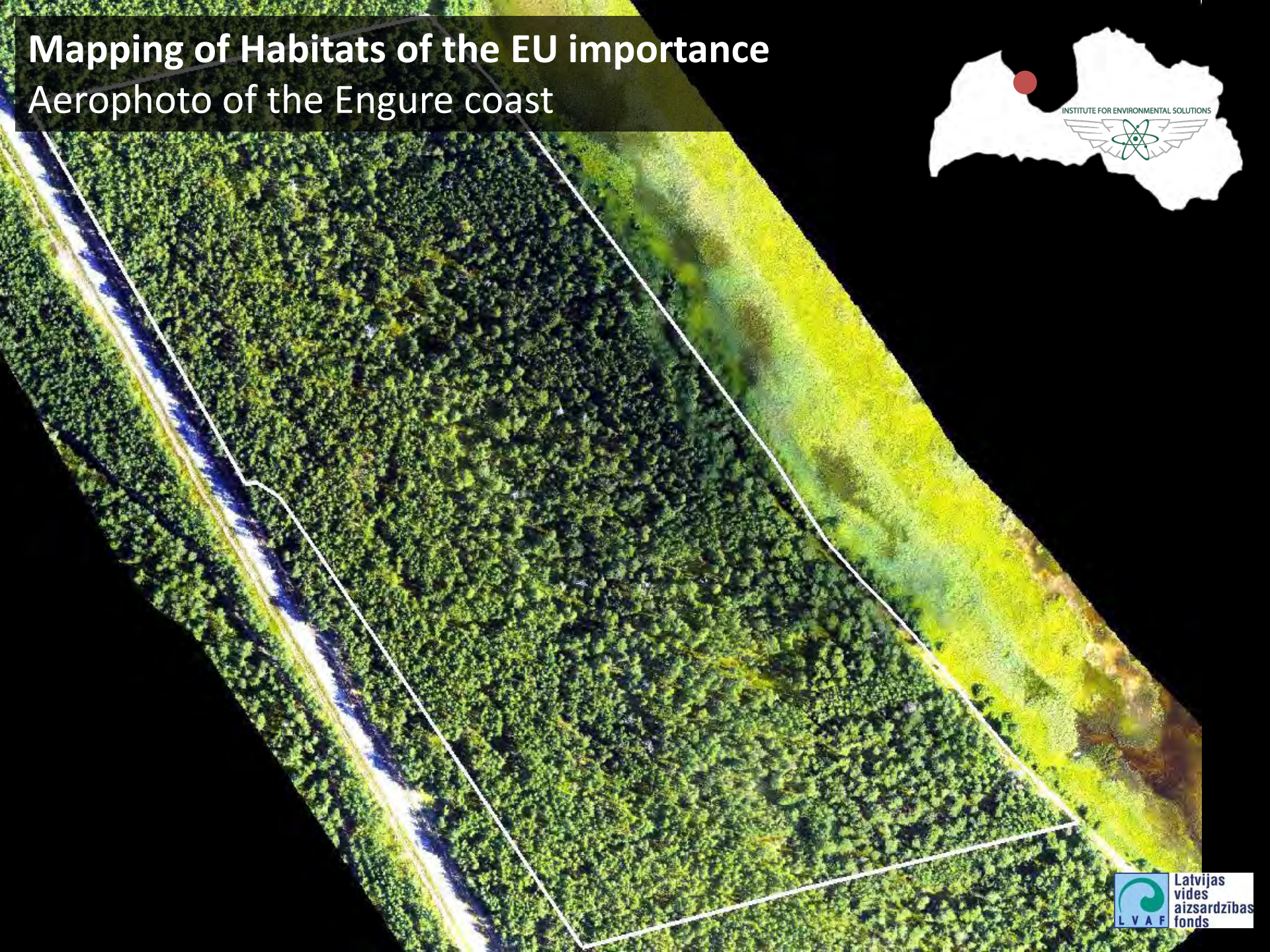
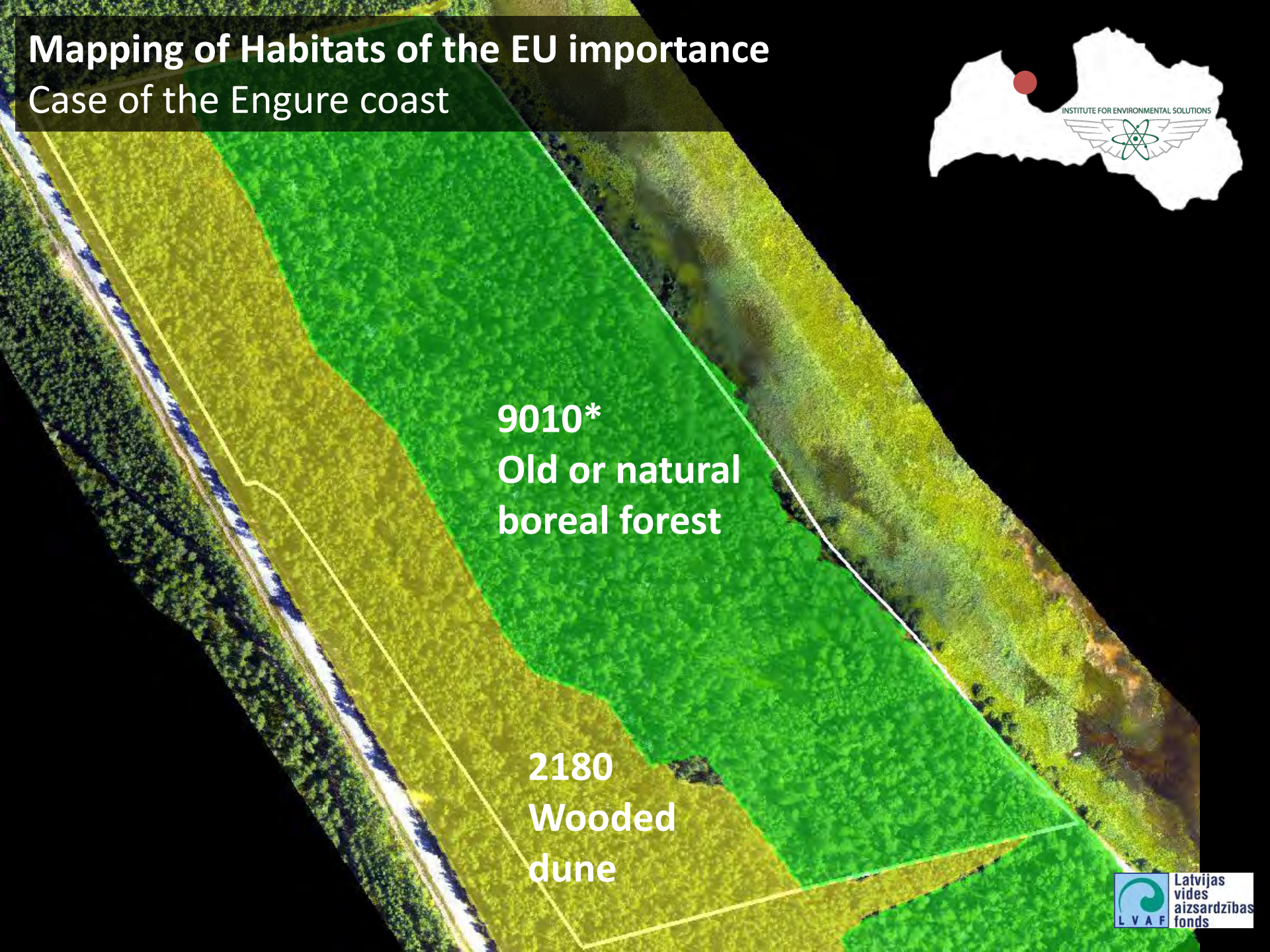
Mapping of Habitats of the EU importance

Aerophoto of the Engure coast



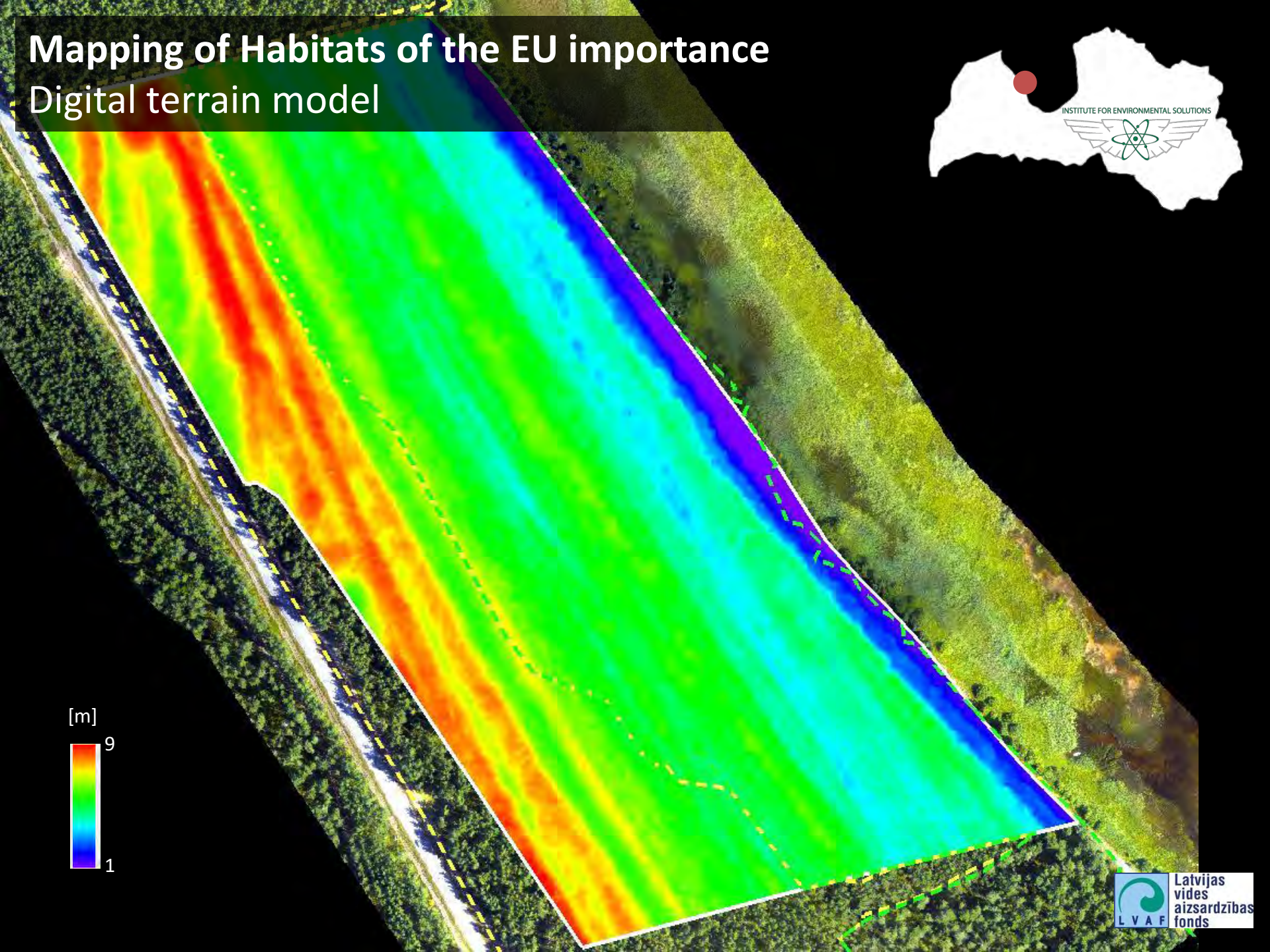
Mapping of Habitats of the EU importance

Case of the Engure coast



Mapping of Habitats of the EU importance

Digital terrain model



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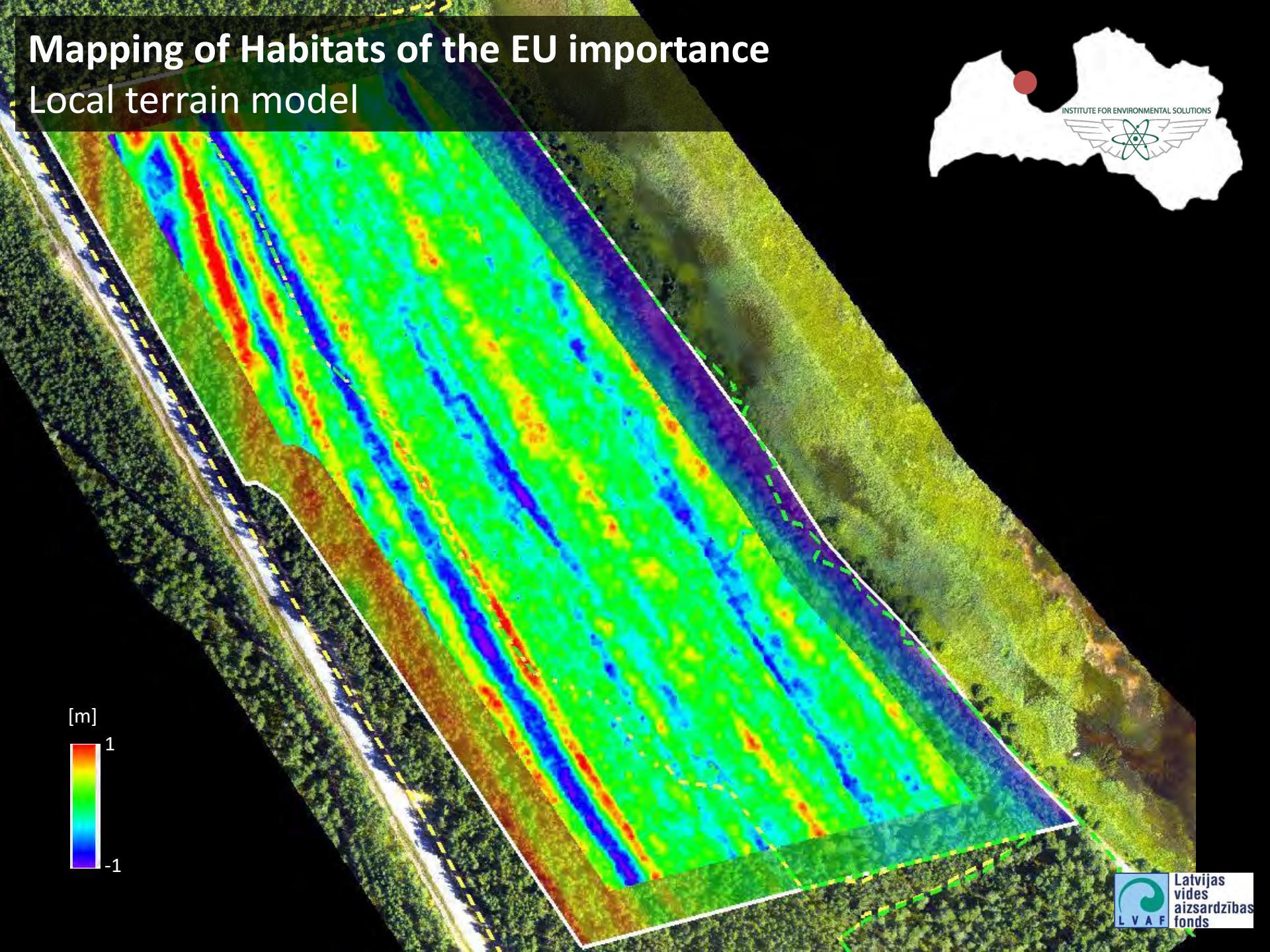
Mapping of Habitats of the EU importance

Local terrain model



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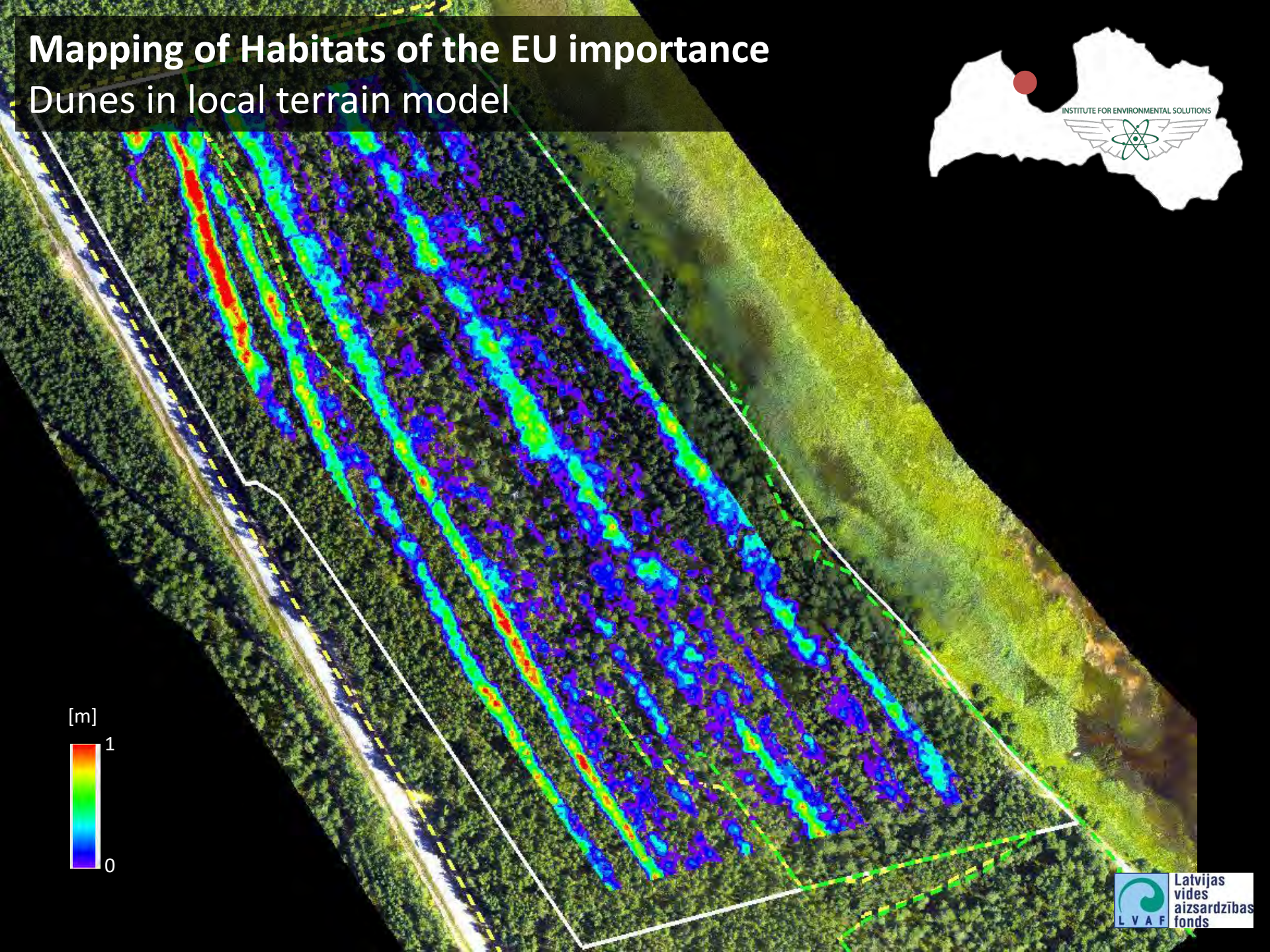
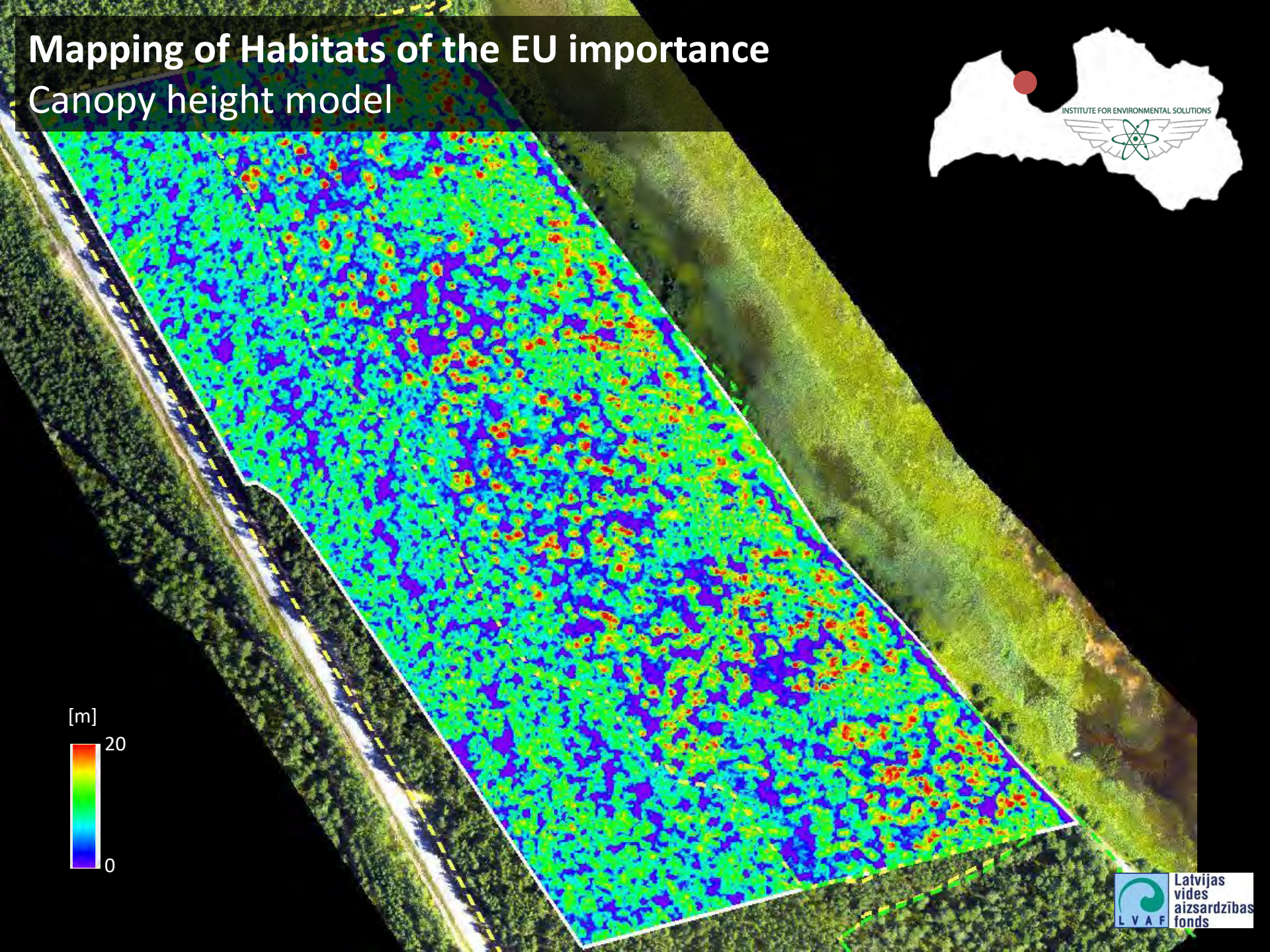
Mapping of Habitats of the EU importance

Dunes in local terrain model



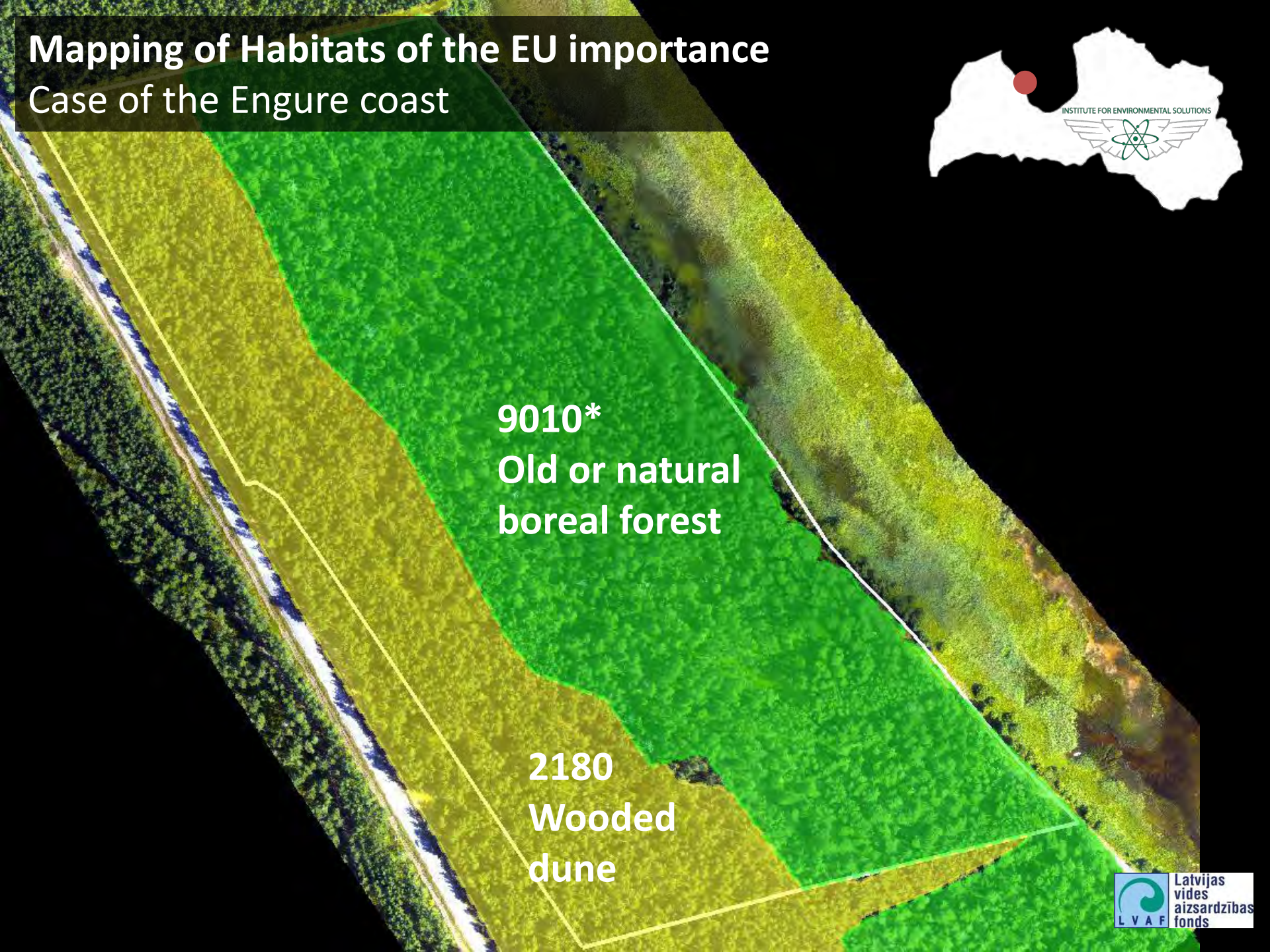
Mapping of Habitats of the EU importance

Canopy height model



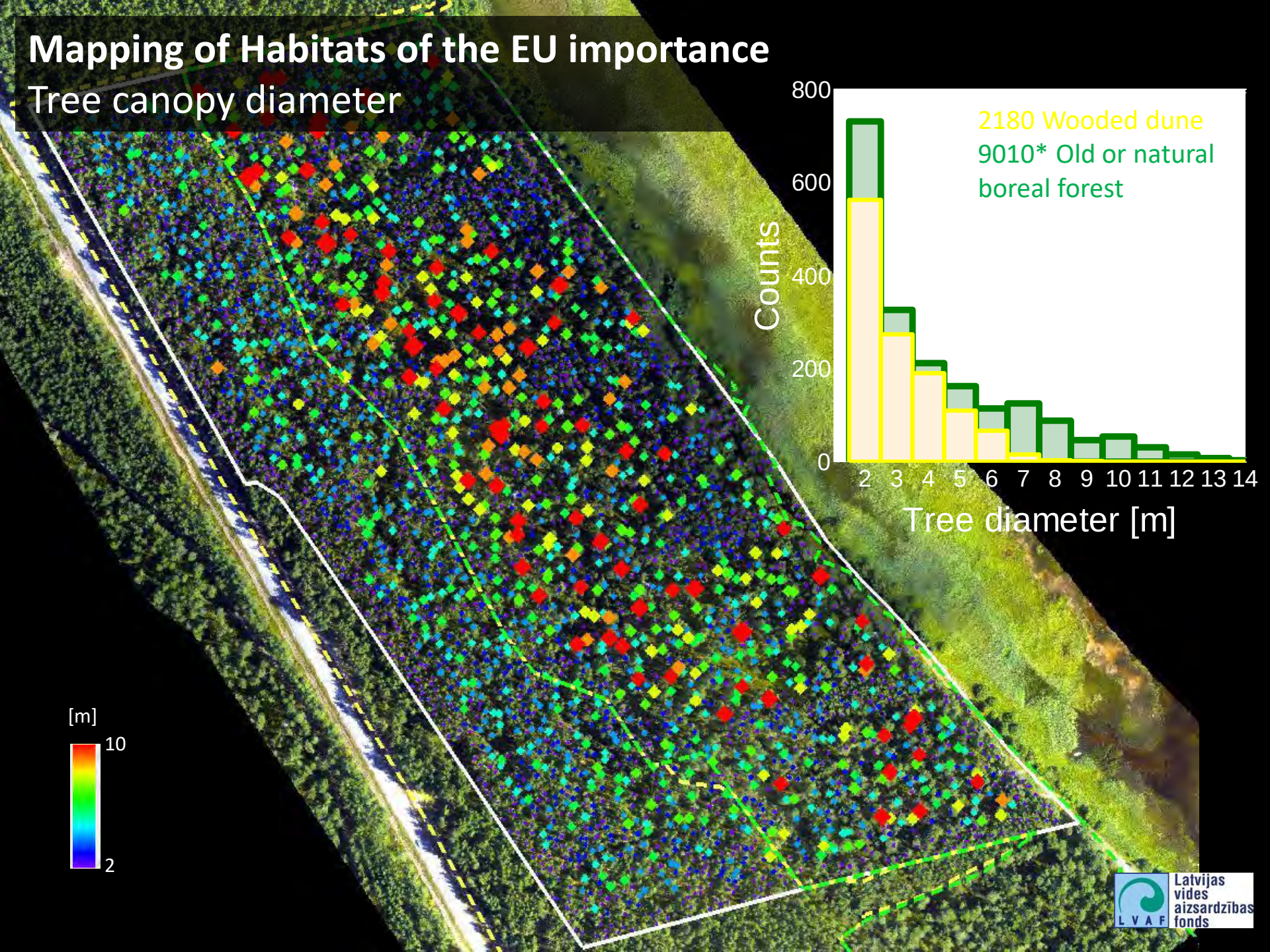
Mapping of Habitats of the EU importance

Case of the Engure coast



Mapping of Habitats of the EU importance

Tree canopy diameter



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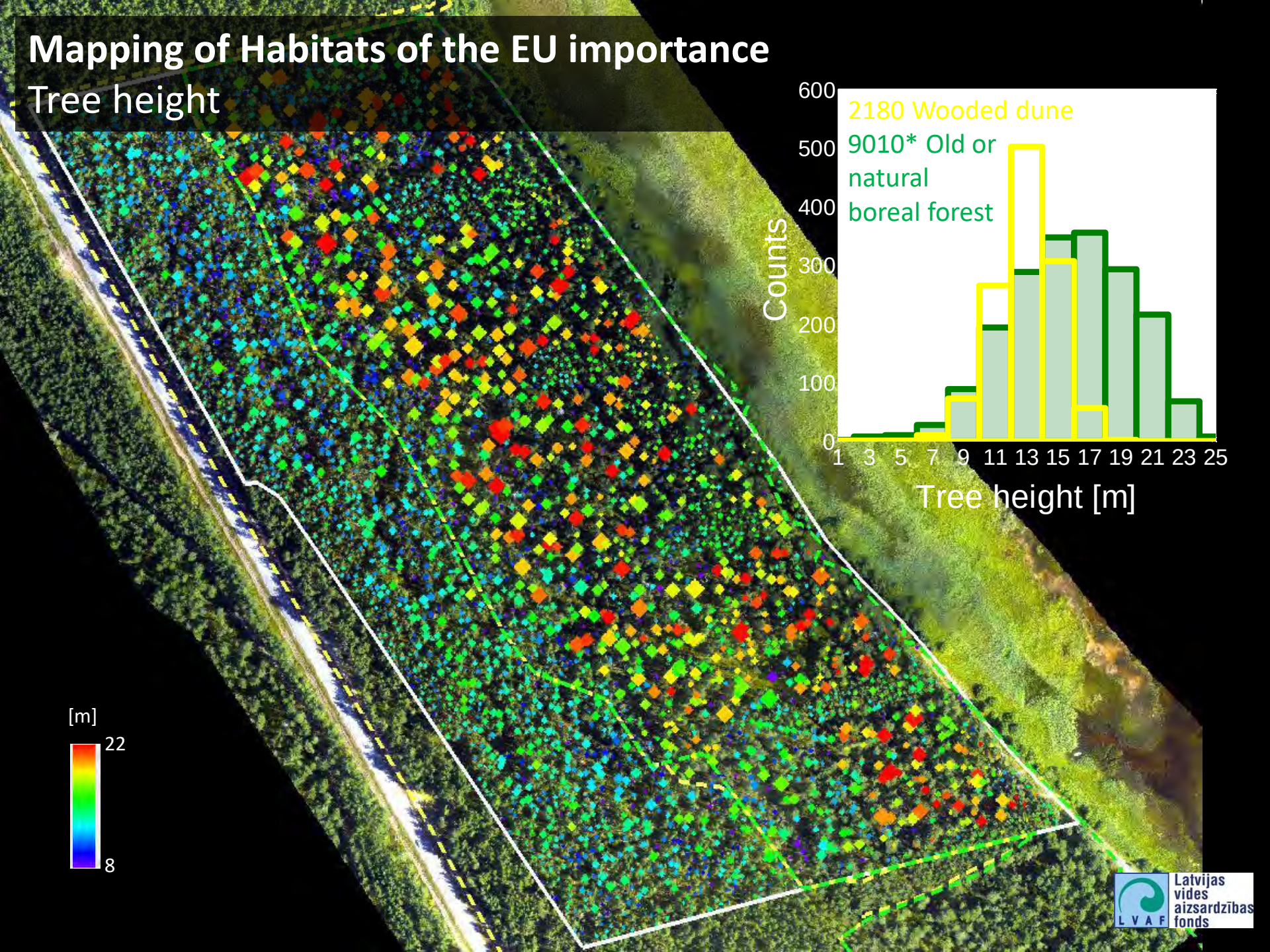
Mapping of Habitats of the EU importance

Tree height



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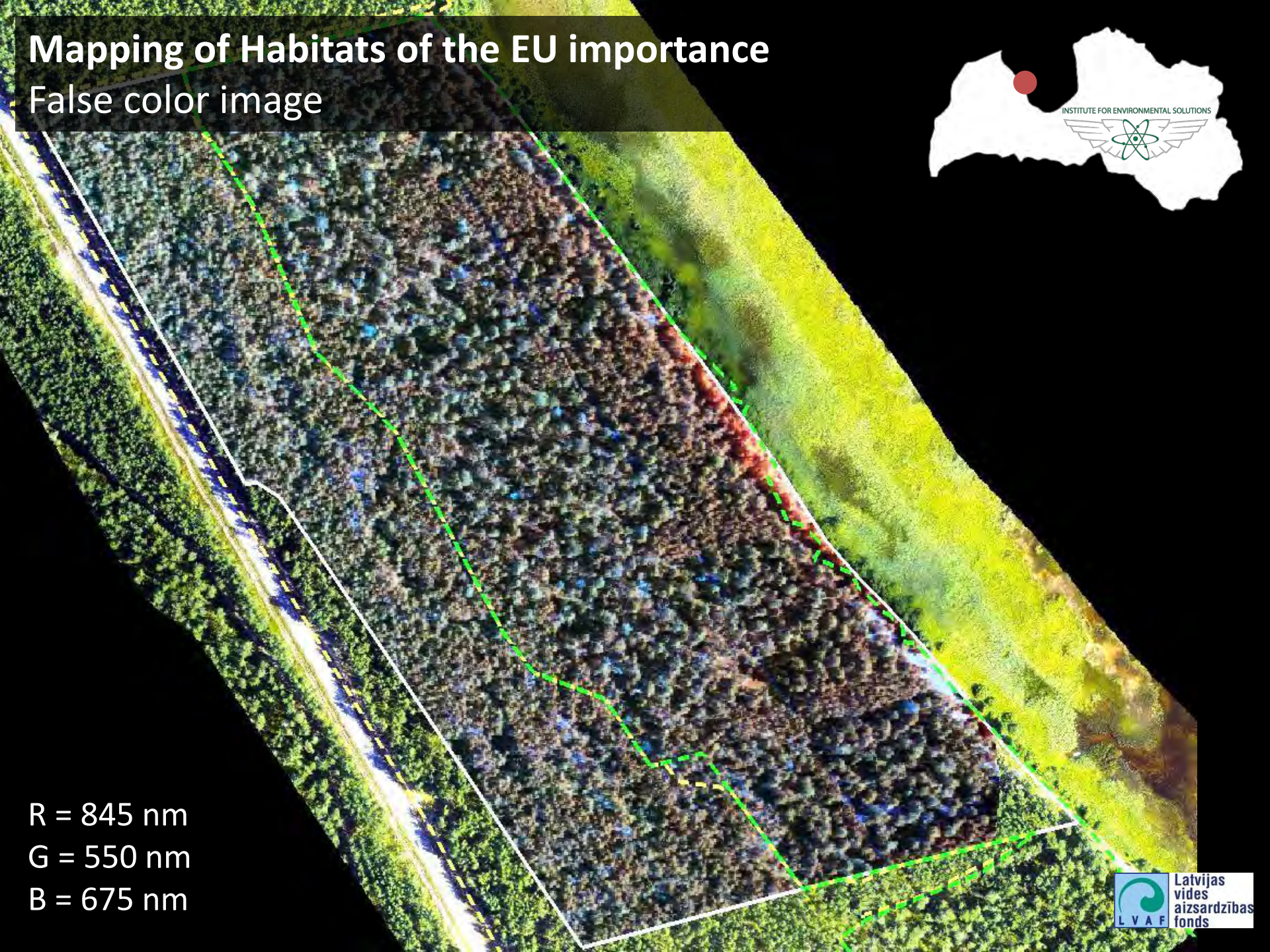
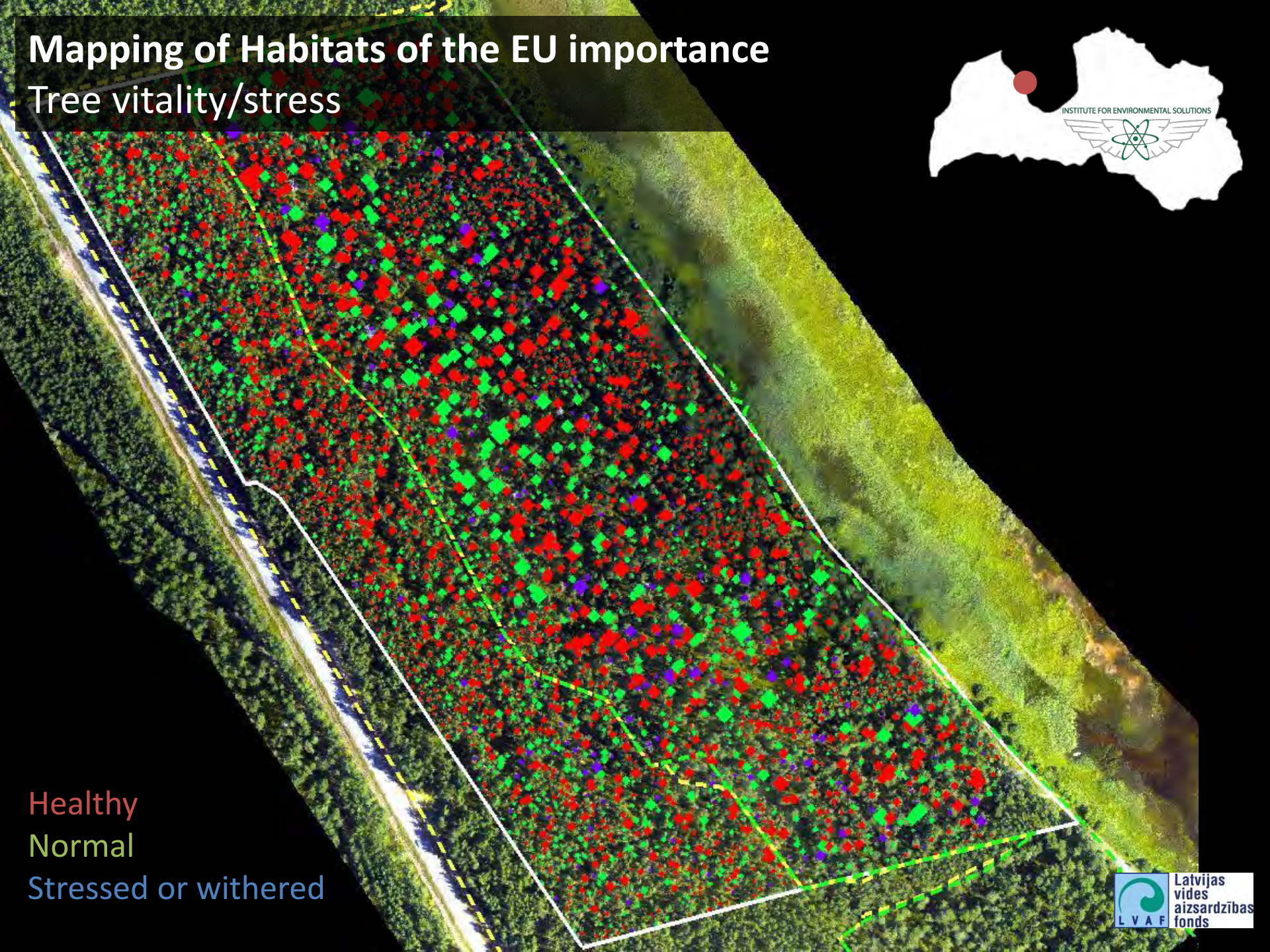
Mapping of Habitats of the EU importance

False color image



Mapping of Habitats of the EU importance

Tree vitality/stress



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Forest Habitat Restoration within the Gauja National Park

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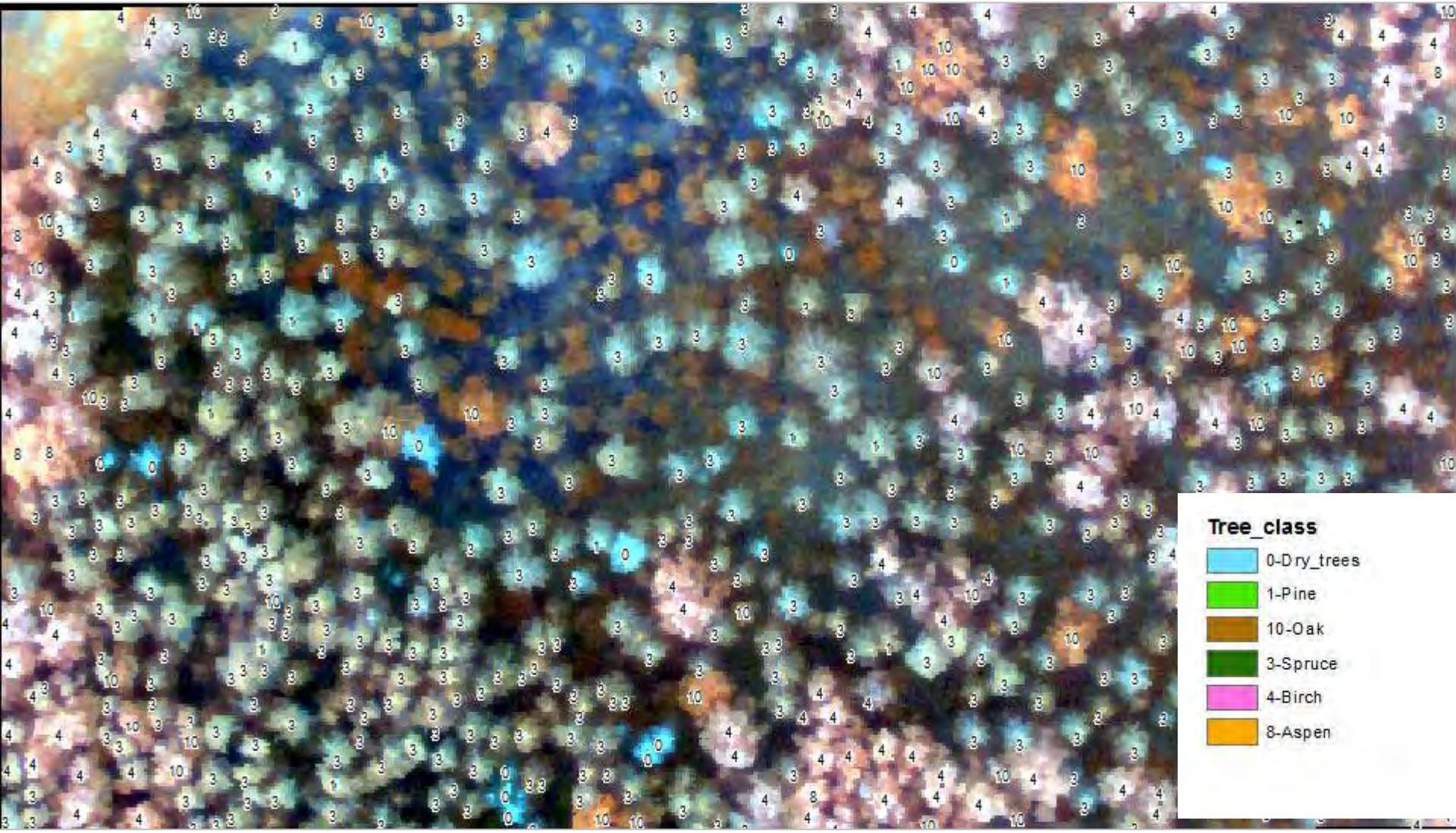

FOR-REST

Digital terrain model (DTM) of the Gauja river valley

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FOR-REST

Restoring the Hydrological Regime of the Kemeri National Park

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NATURA 2000

HYDROPLAN
LIFE+ projekts

Life

Development of Methodology for Identification and Biomass Assessment of the Giant Hogweed (*Heracelum sosnowskyi*)

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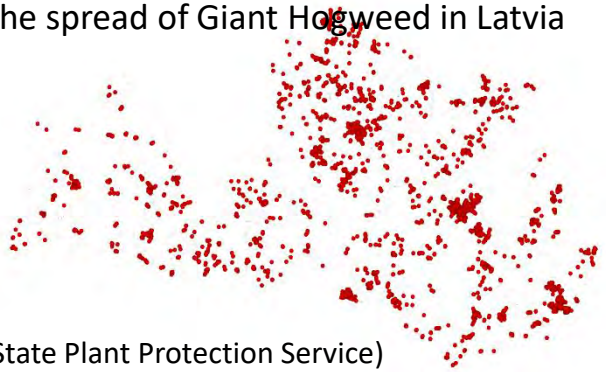
The spread of Giant Hogweed in Latvia



(State Plant Protection Service)

The highly invasive, fast spreading Giant Hogweed can grow up to 4 meters and its toxic sap causes severe burns and blistering

1 tonne of the Giant Hogweed's (*Heracleum sosnovskyi*) biomass can be used to extract 30 to 50 litres of biofuel.

ERAF
EIROPAS REĢIONĀLĀS ATTĪSTĪBAS FONDS

Development of Methodology for Identification and Biomass Assessment of the Giant Hogweed (*Heracelum sosnowskyi*)

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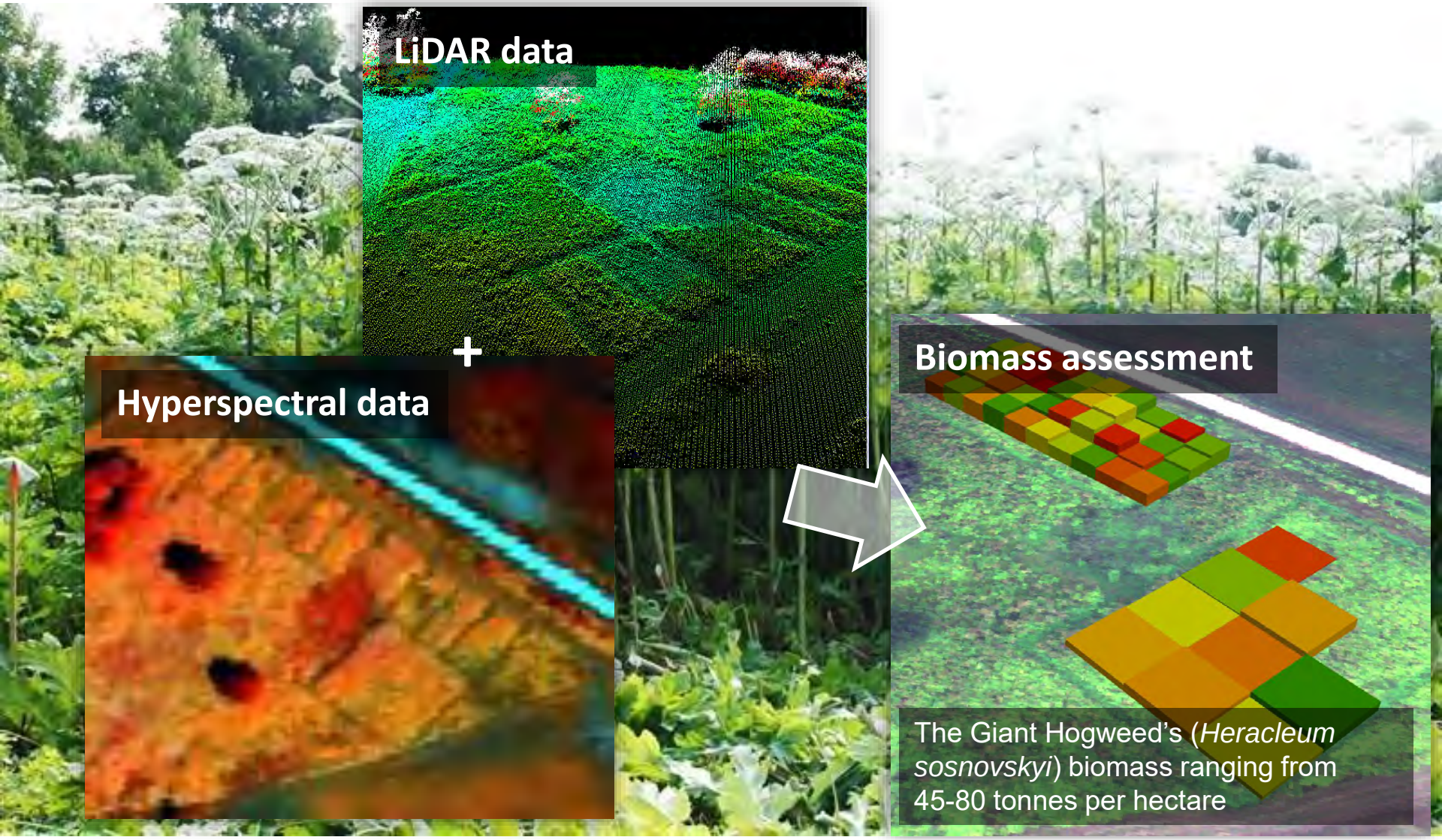

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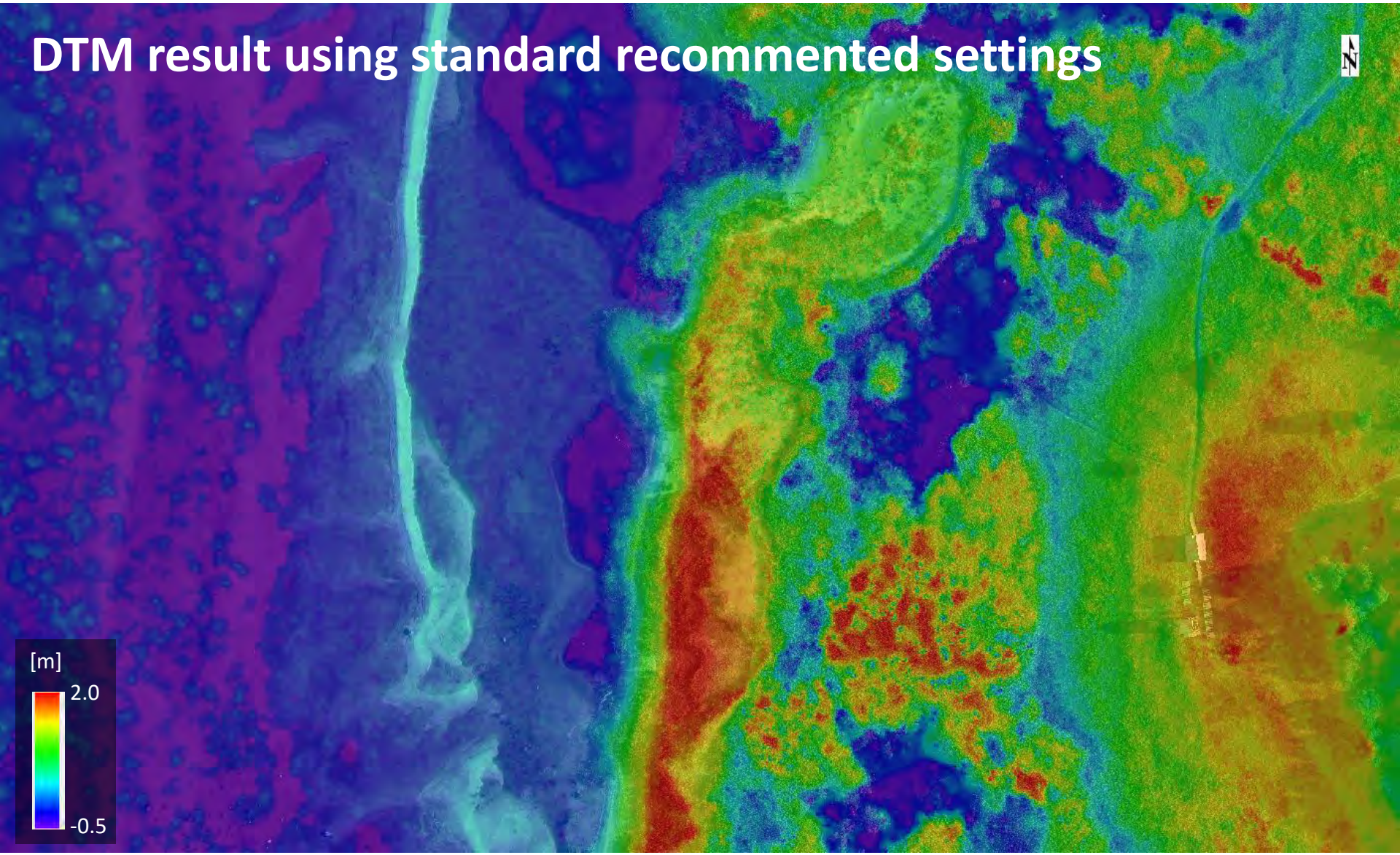
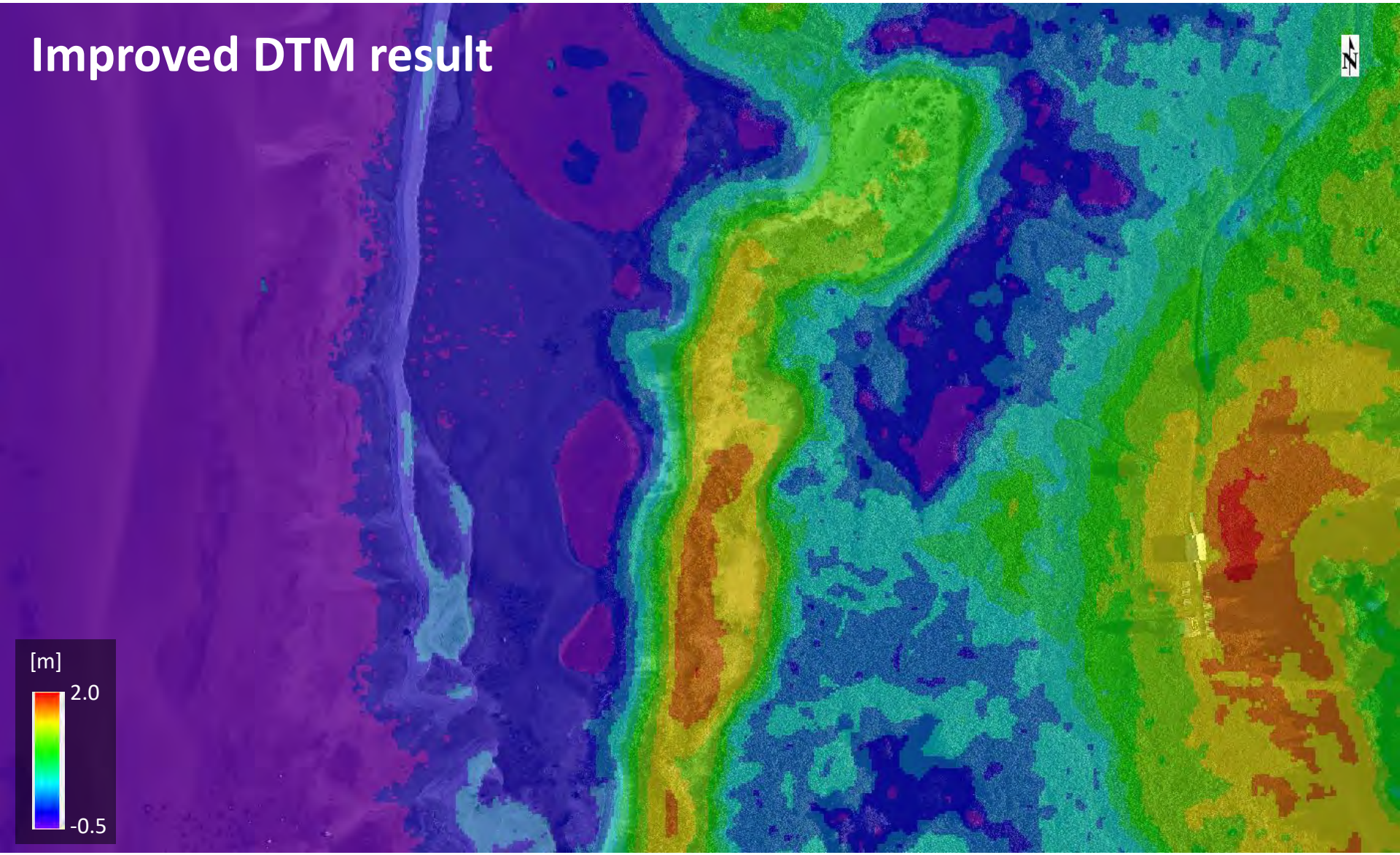
Dense vegetation and DTM extraction

Dense vegetation and DTM extraction



Dense vegetation and DTM extraction



In Search for Archeological Heritage:
The medieval defence system of Straupe parish

Aerial photography of the ce ling
Straupe parish n

In Search for Archeological Heritage: Case of Koknese Fortress

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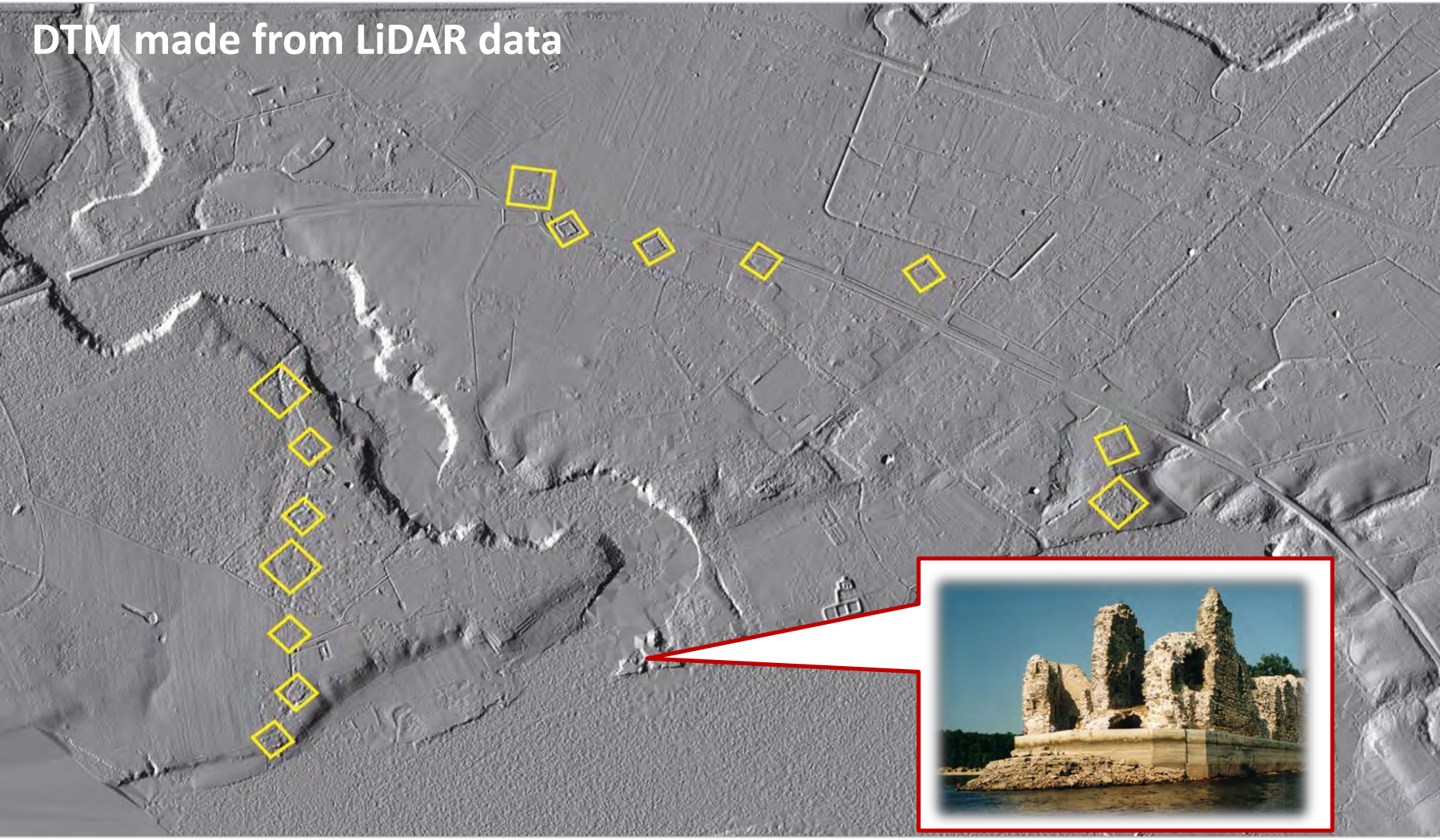
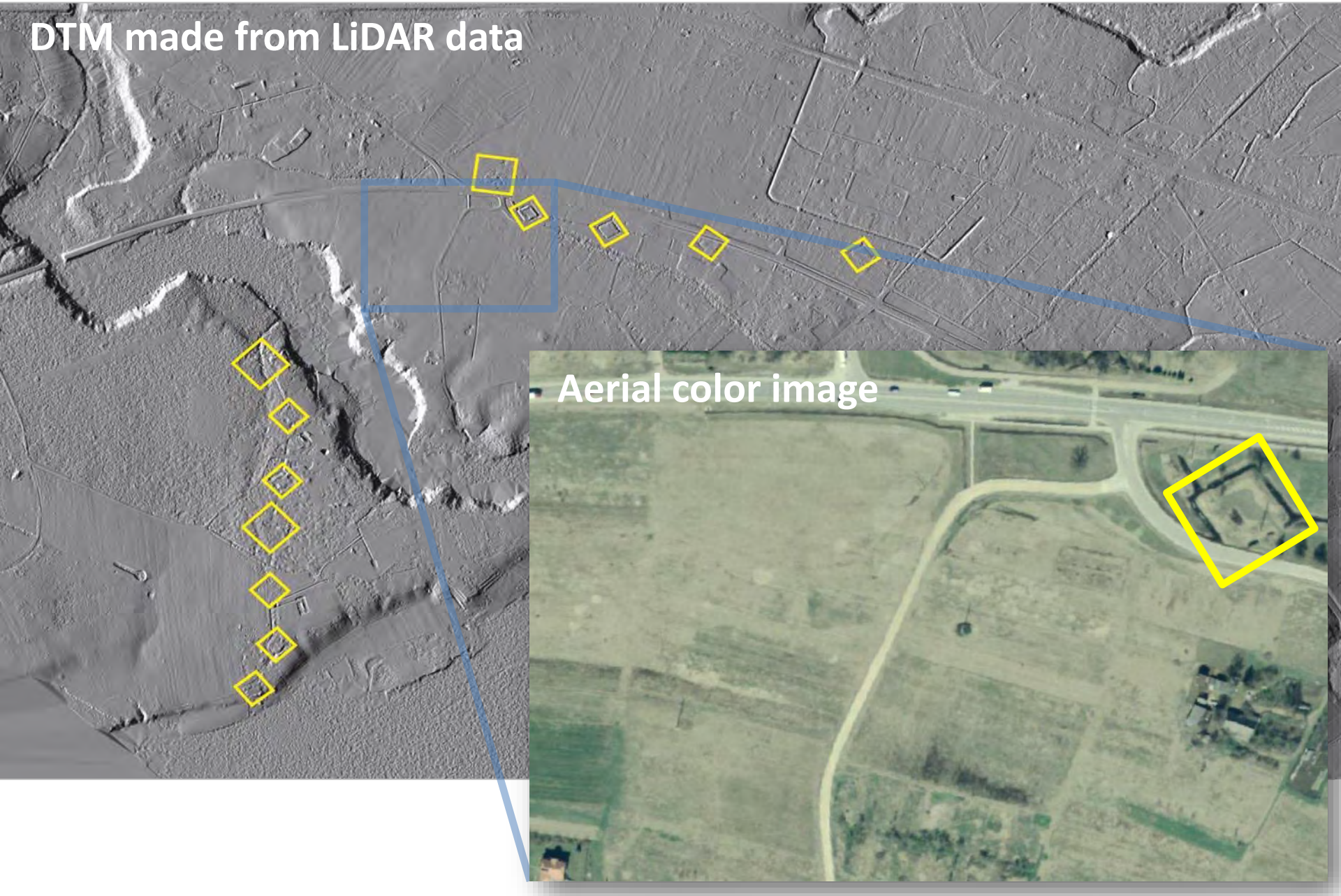


In Search for Archeological Heritage: Case of Koknese Fortress



In Search for Archeological Heritage: Case of Koknese Fortress

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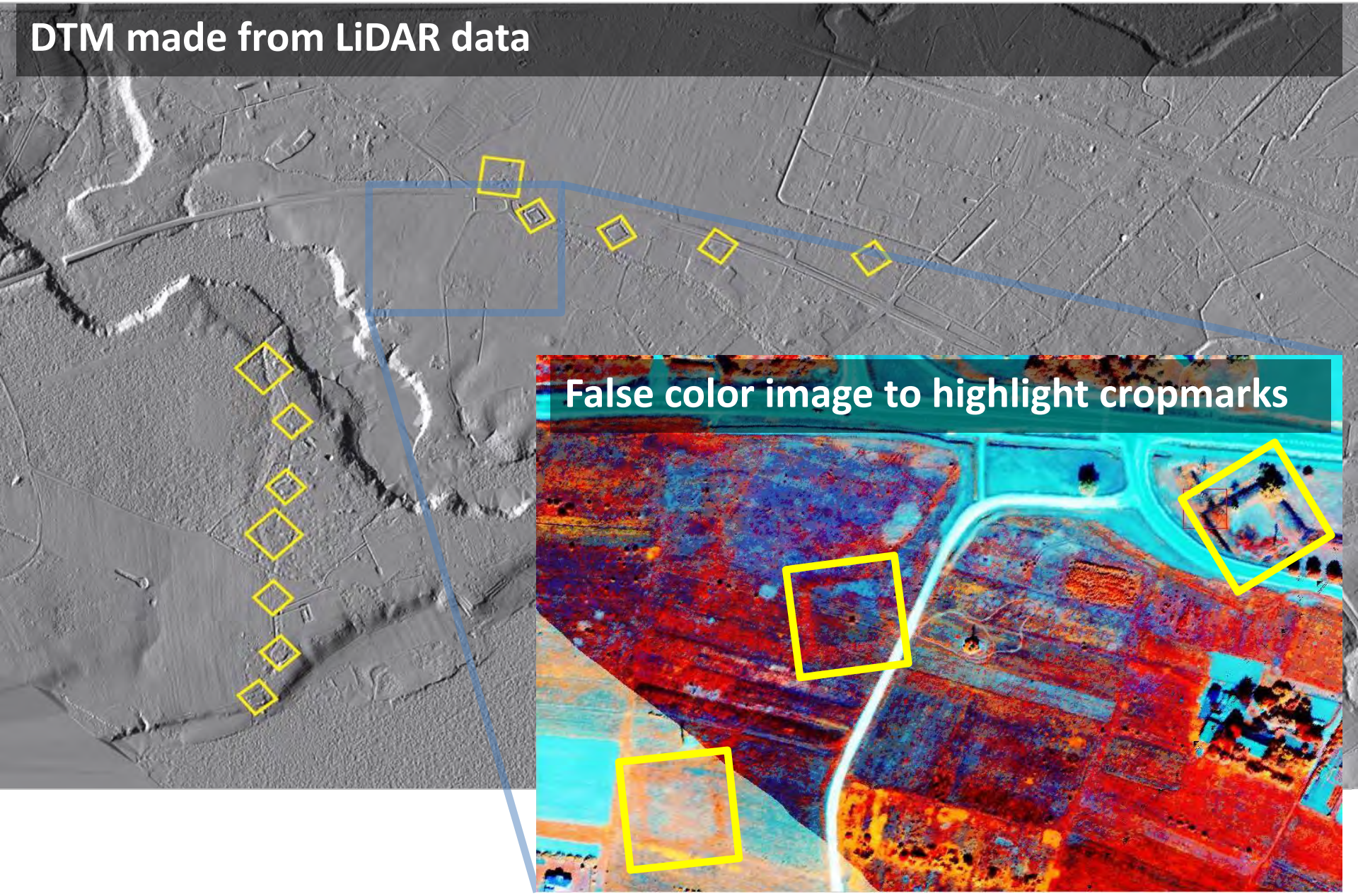
DTM made from LiDAR data



False color image to highlight cropmarks

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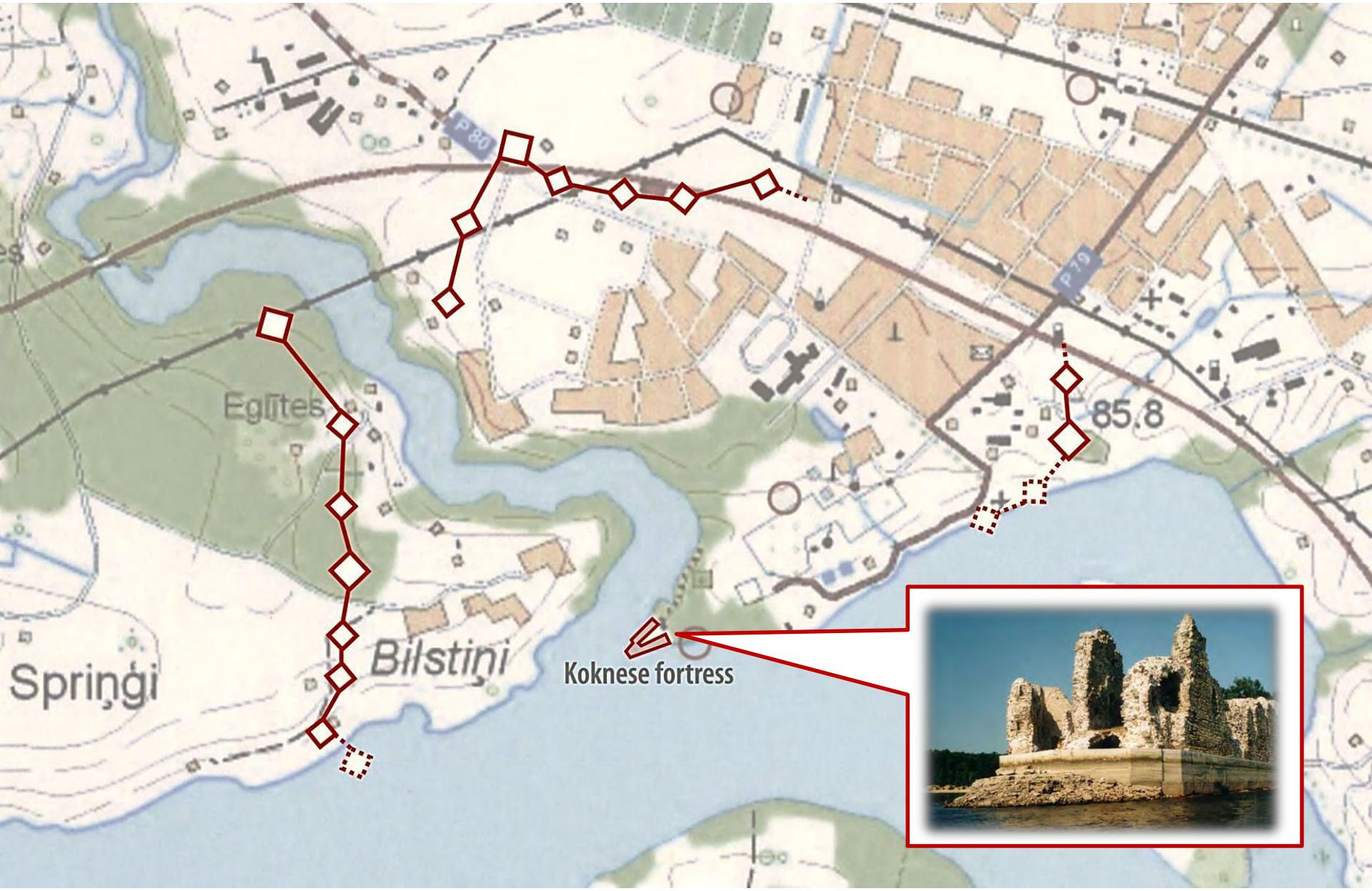

Remote sensing is the science (and to some extent, art) of acquiring information about the Earth's surface without actually being in contact with it.

/Canada Centre for Remote Sensing/

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