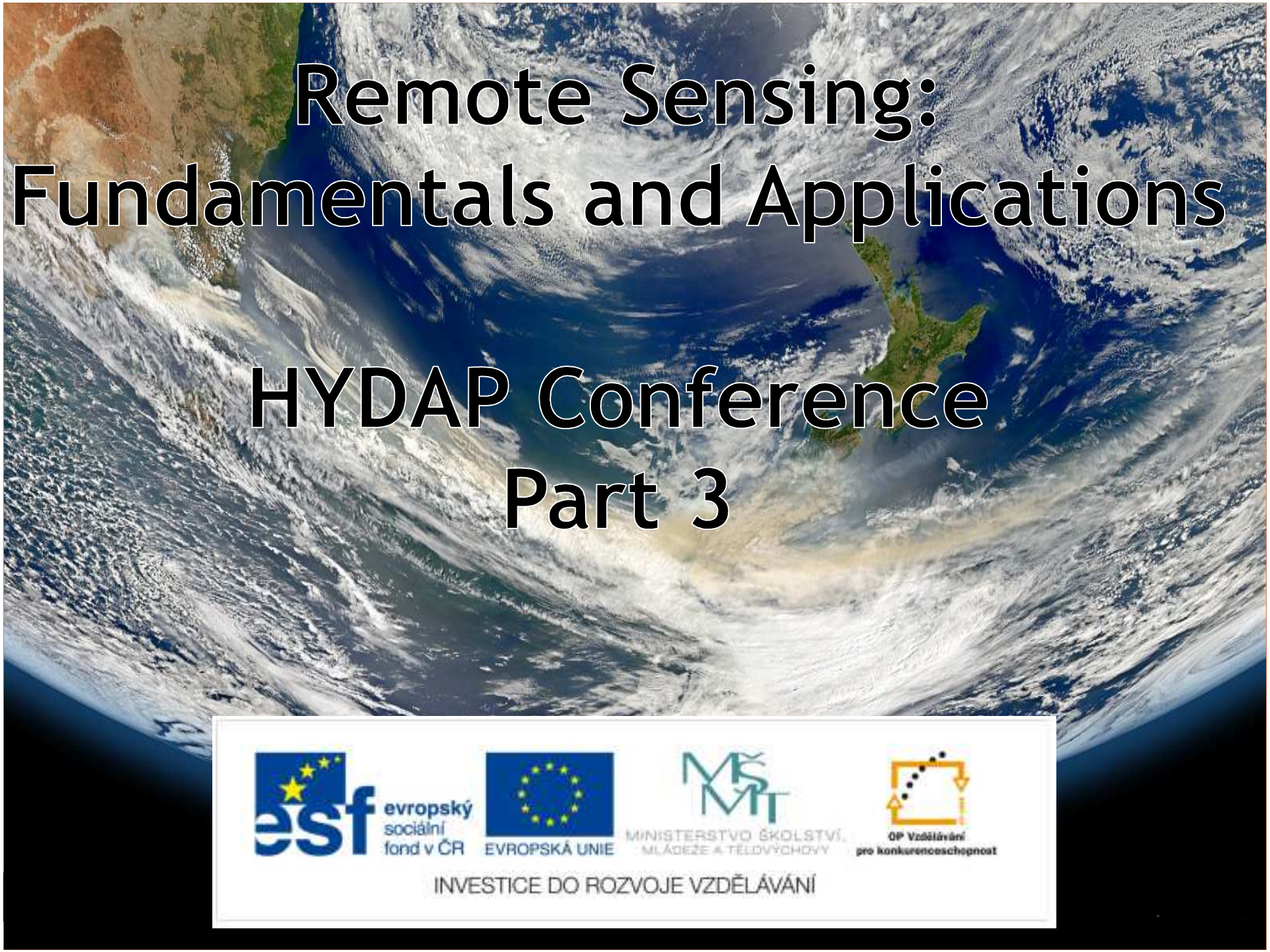


Remote Sensing: Fundamentals and Applications

HYDAP Conference
Part 3

evropský sociální fond v ČR
EVROPSKÁ UNIE
MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY
OP Vzdělávání pro konkurenceschopnost
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Applications

- Agriculture
- Forestry
- Hydrology
- Geology
- Land Use
- Change Detection

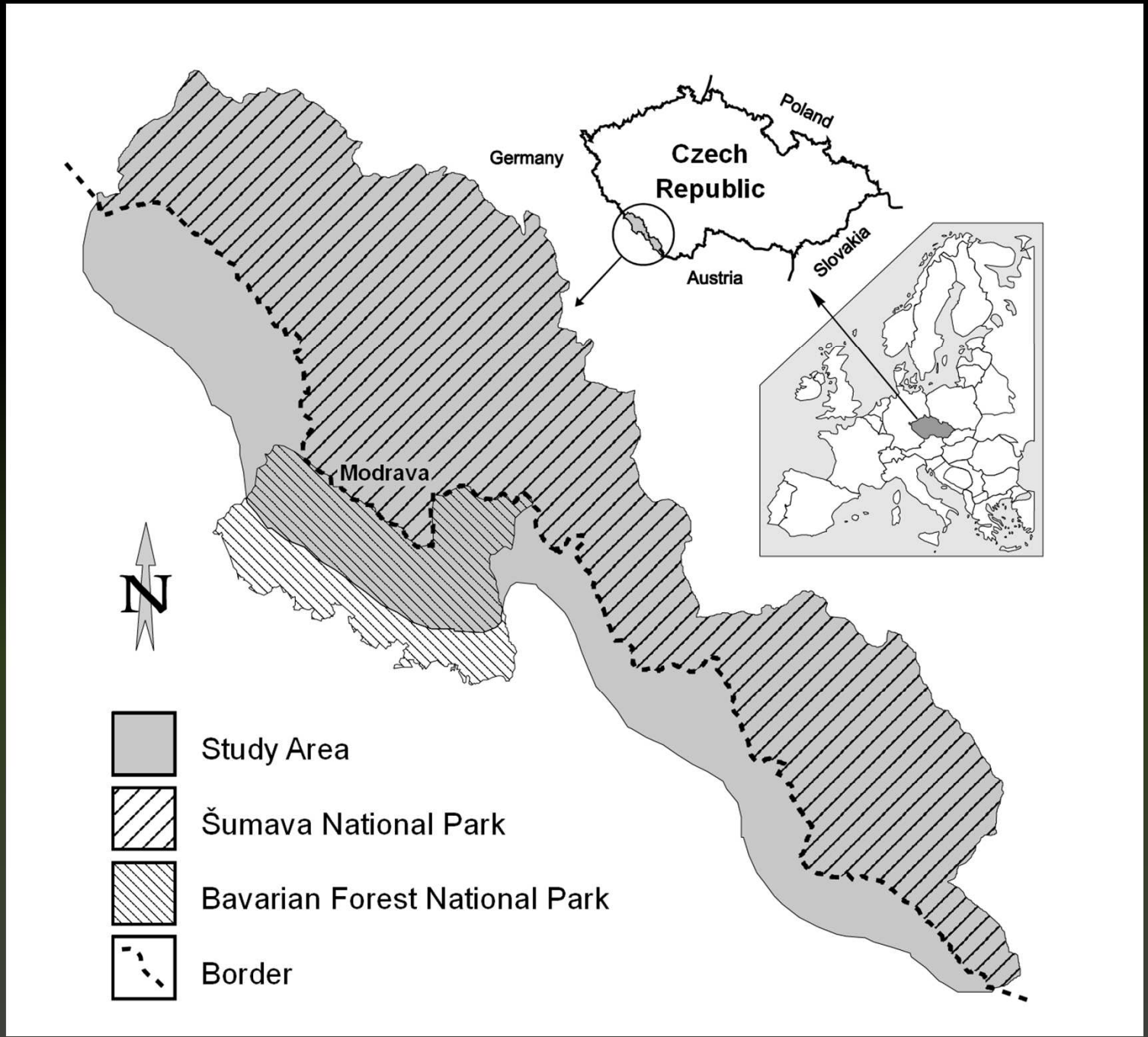
Thermal IR

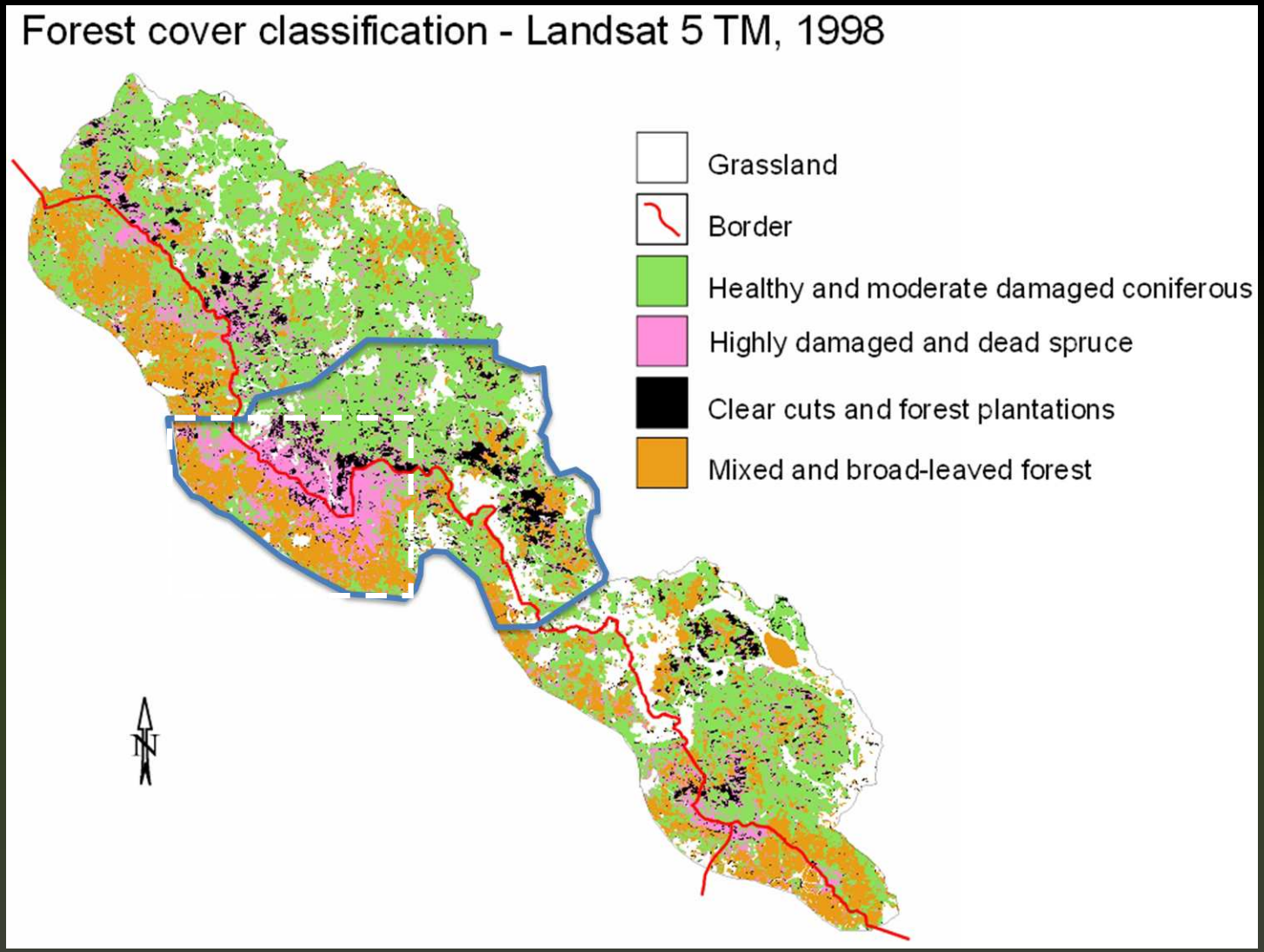
- Landsat and ASTER both carry thermal IR imagers
- Emitted radiance is a function of both emissivity and temperature
- Emissivity is useful in determining surface composition
- Temperature is useful for surface energy and water balance, and temperature pollution
- At-surface radiances must first be computed
- Temperature-Emissivity separation methods yield LST

$$L_{s,j} = [\varepsilon_j B_j(T) + (1-\varepsilon_j)F_{\mathrm{sky},j}/\pi]\tau_j + L_{a,j}$$

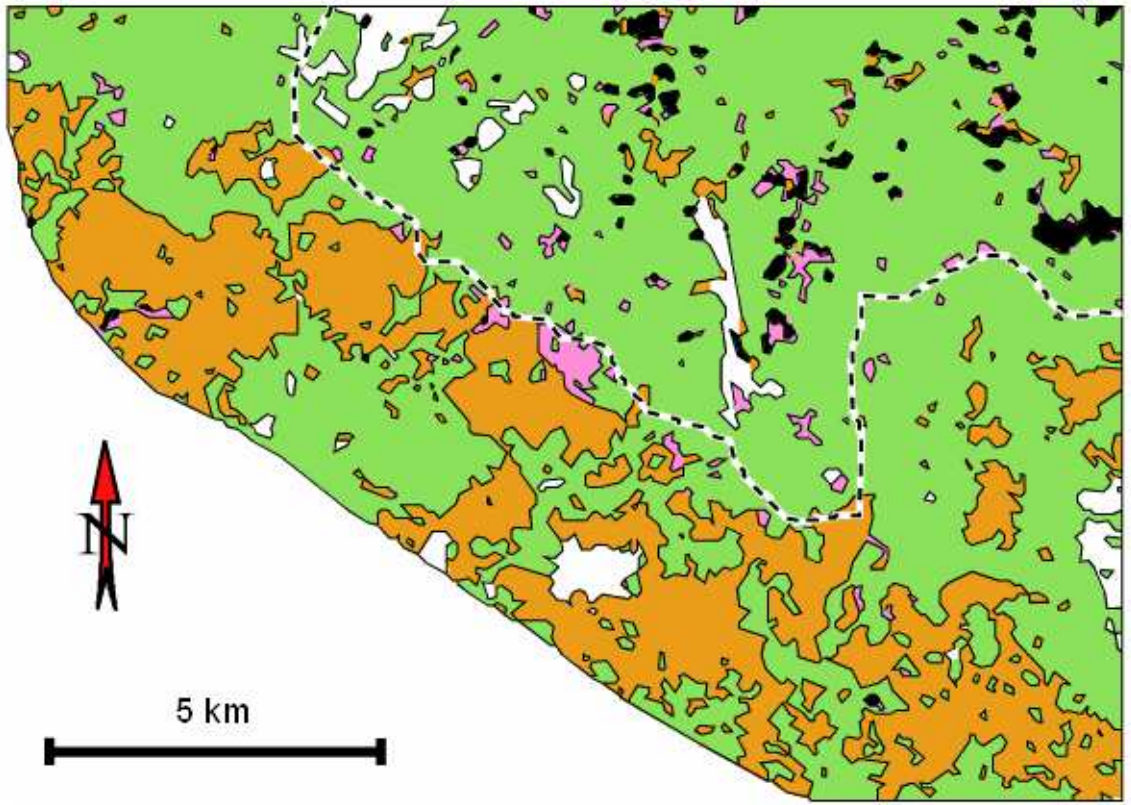
Sumava Bark Beetle

- Using RS to study outbreaks and regeneration process in spruce forests


Poland
Germany
Czech Republic
Austria
Slovakia
Modrava
N
Study Area
Šumava National Park
Bavarian Forest National Park
Border


Forest cover classification - Landsat 5 TM, 1998
Grassland
Border
Healthy and moderate damaged coniferous
Highly damaged and dead spruce
Clear cuts and forest plantations
Mixed and broad-leaved forest
N

Forest cover changes in the Modrava region in 1989



Grassland

Border

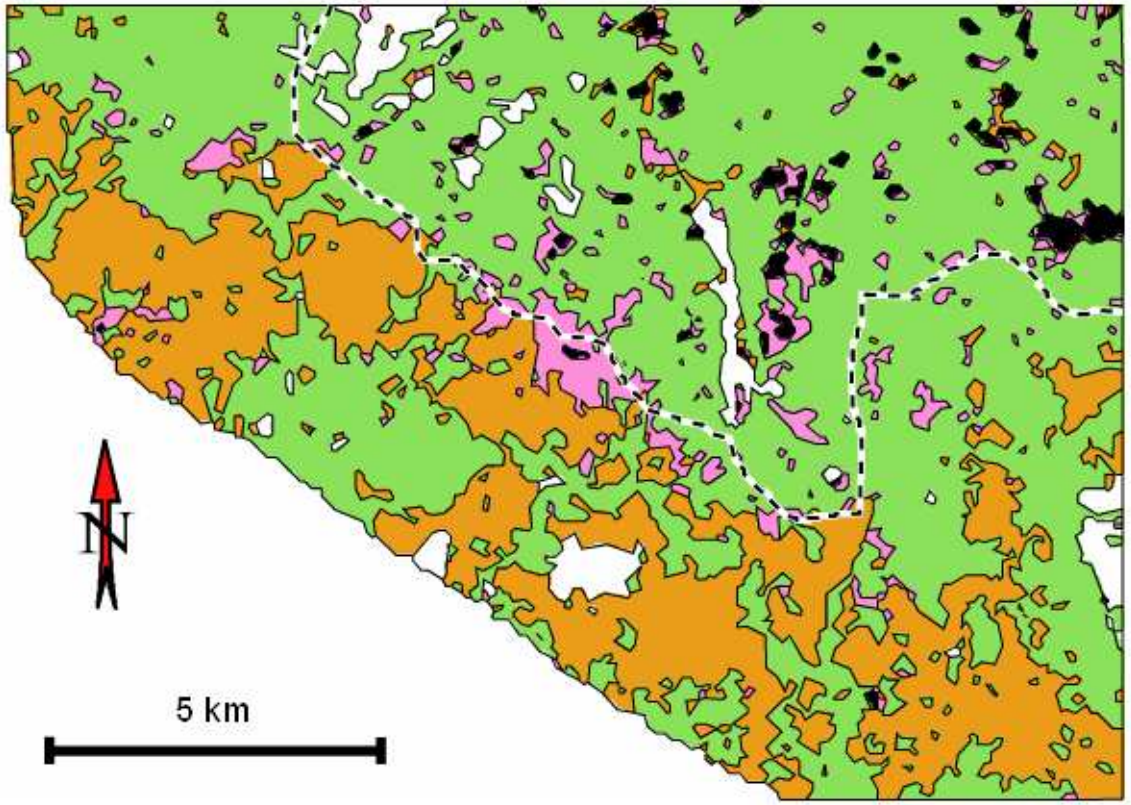
Healthy and moderate damaged coniferous

Highly damaged and dead spruce

Clear cuts and forest plantations

Mixed and broad-leaved forest

Forest cover changes in the Modrava region in 1992



Grassland

Border

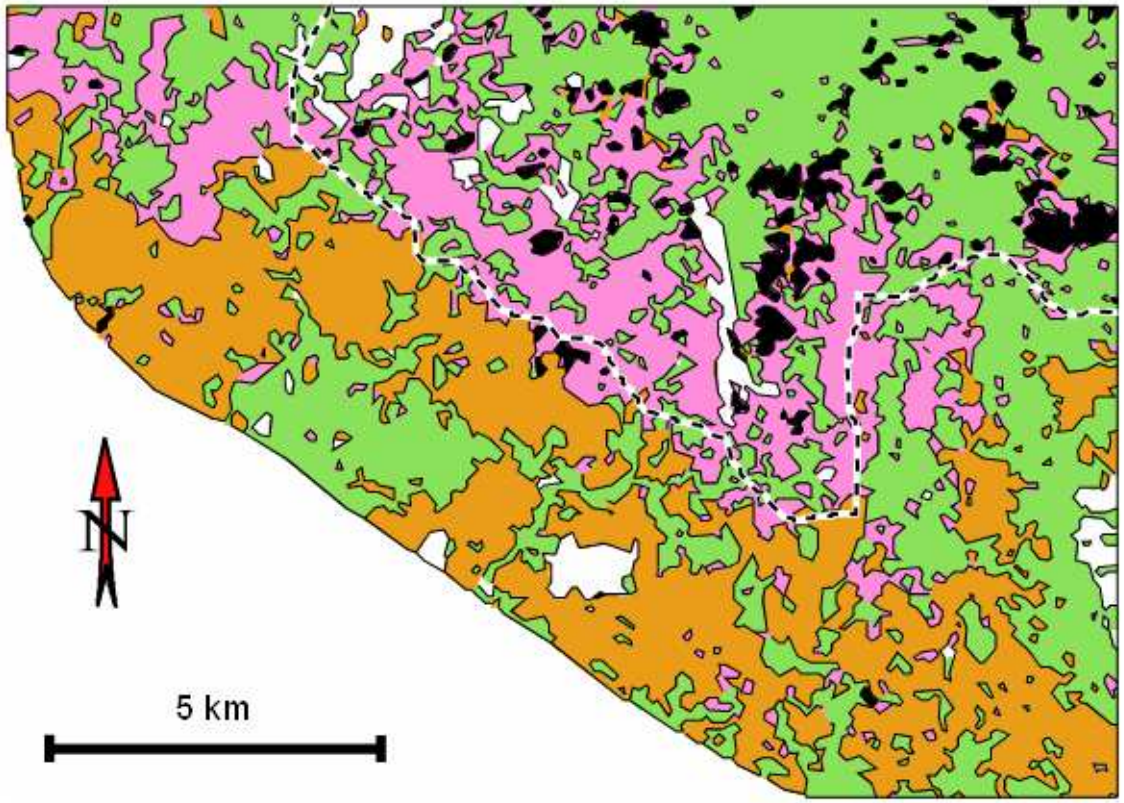
Healthy and moderate damaged coniferous

Highly damaged and dead spruce

Clear cuts and forest plantations

Mixed and broad-leaved forest

Forest cover changes in the Modrava region in 1995



Grassland

Border

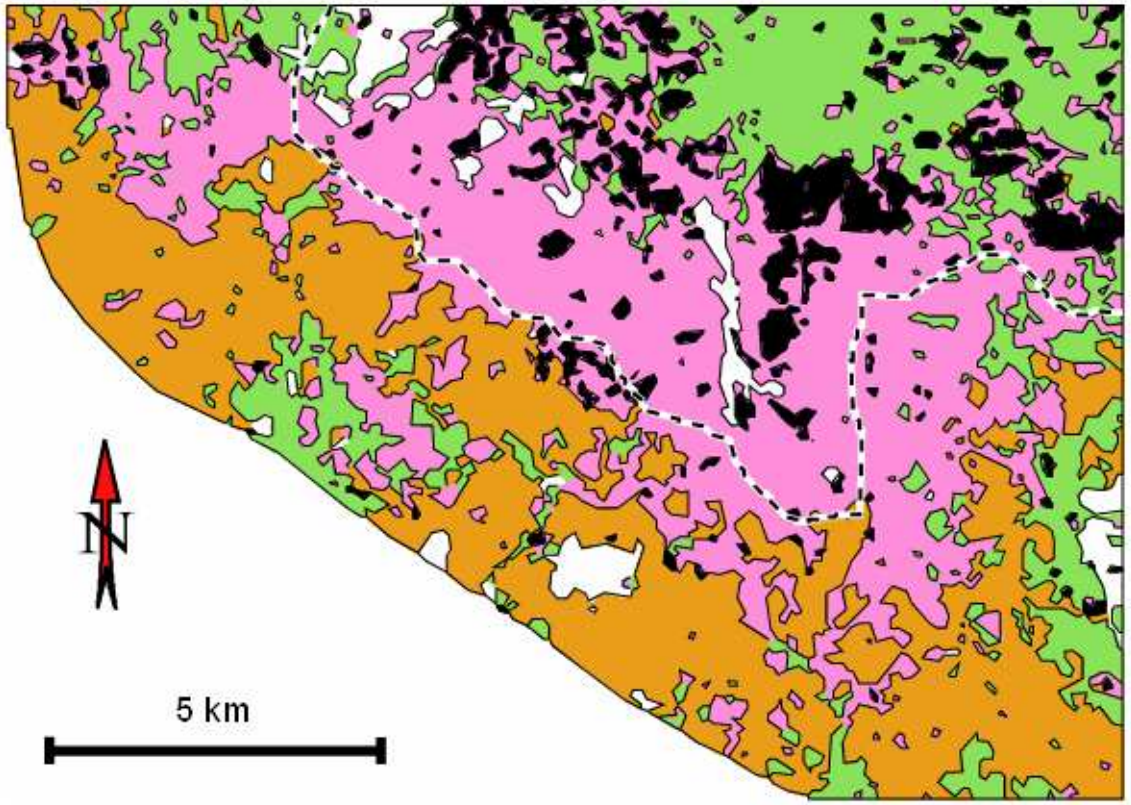
Healthy and moderate damaged coniferous

Highly damaged and dead spruce

Clear cuts and forest plantations

Mixed and broad-leaved forest

Forest cover changes in the Modrava region in 1998



Grassland

Border

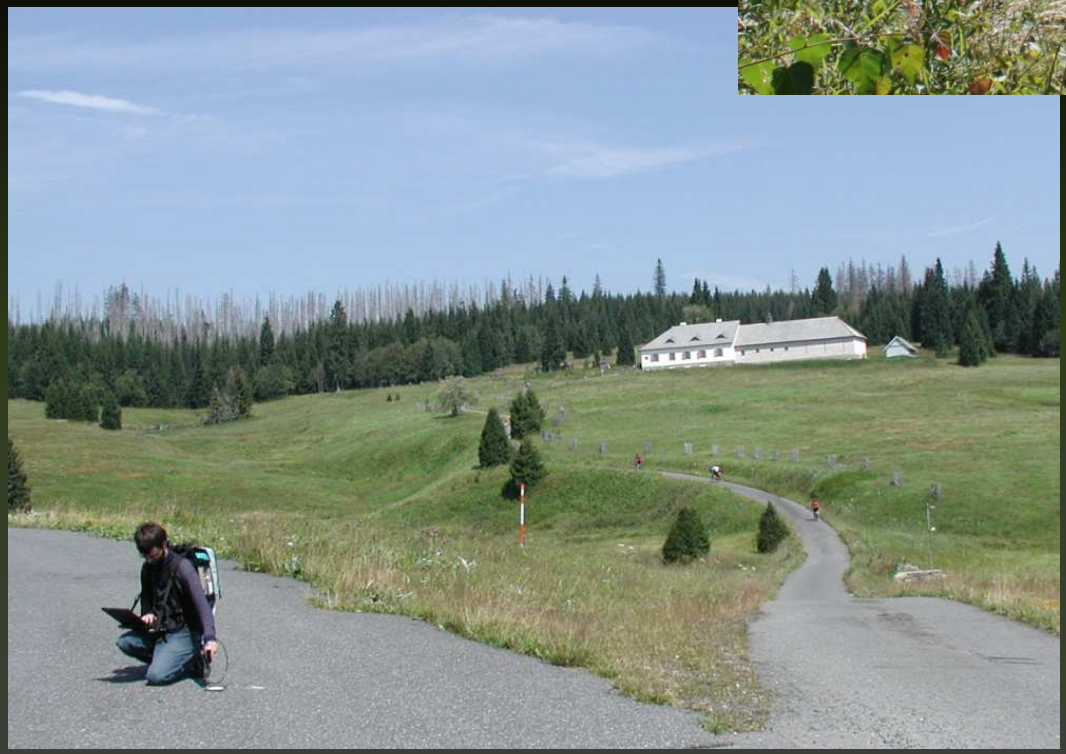
Healthy and moderate damaged coniferous

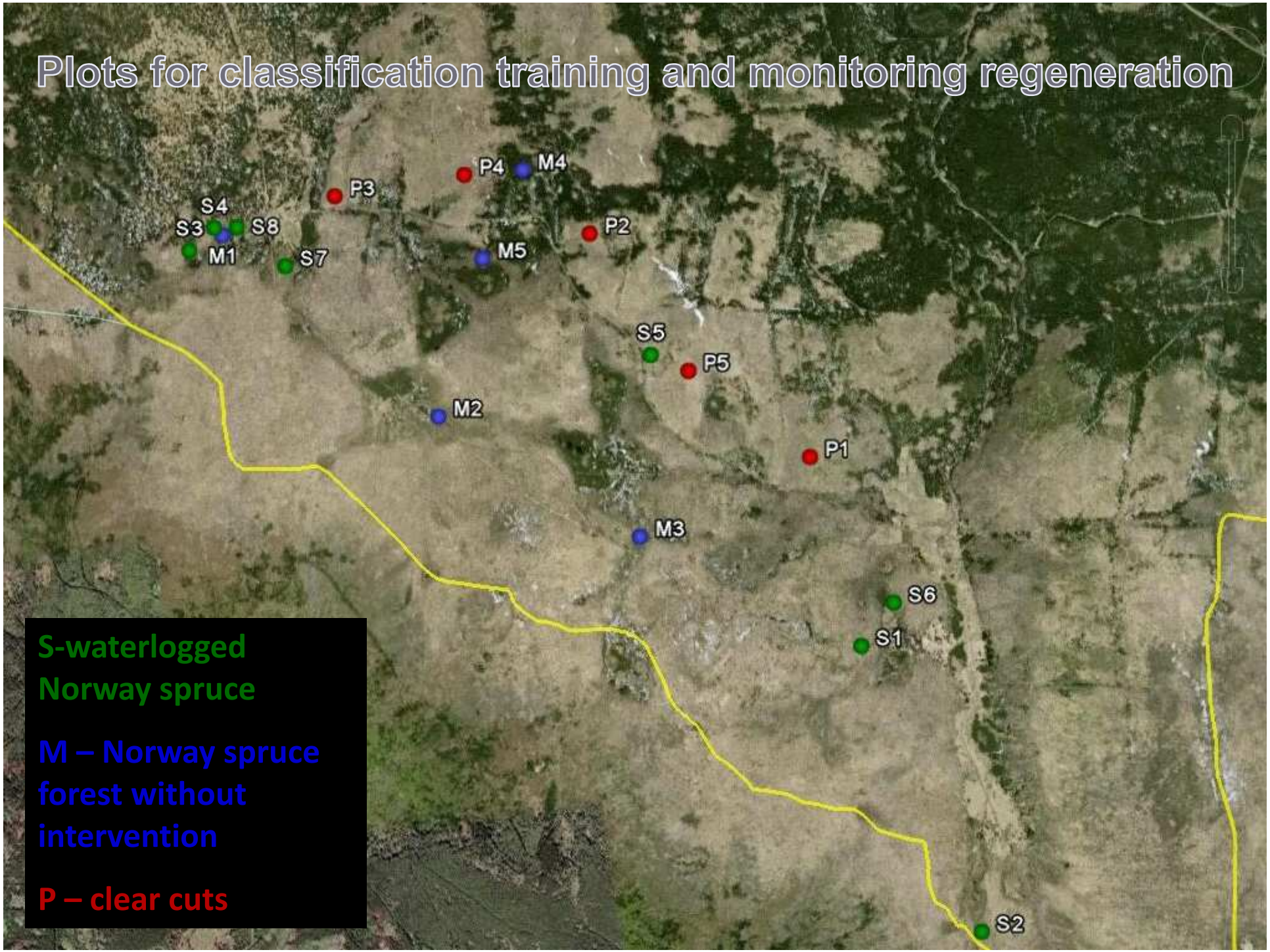
Highly damaged and dead spruce

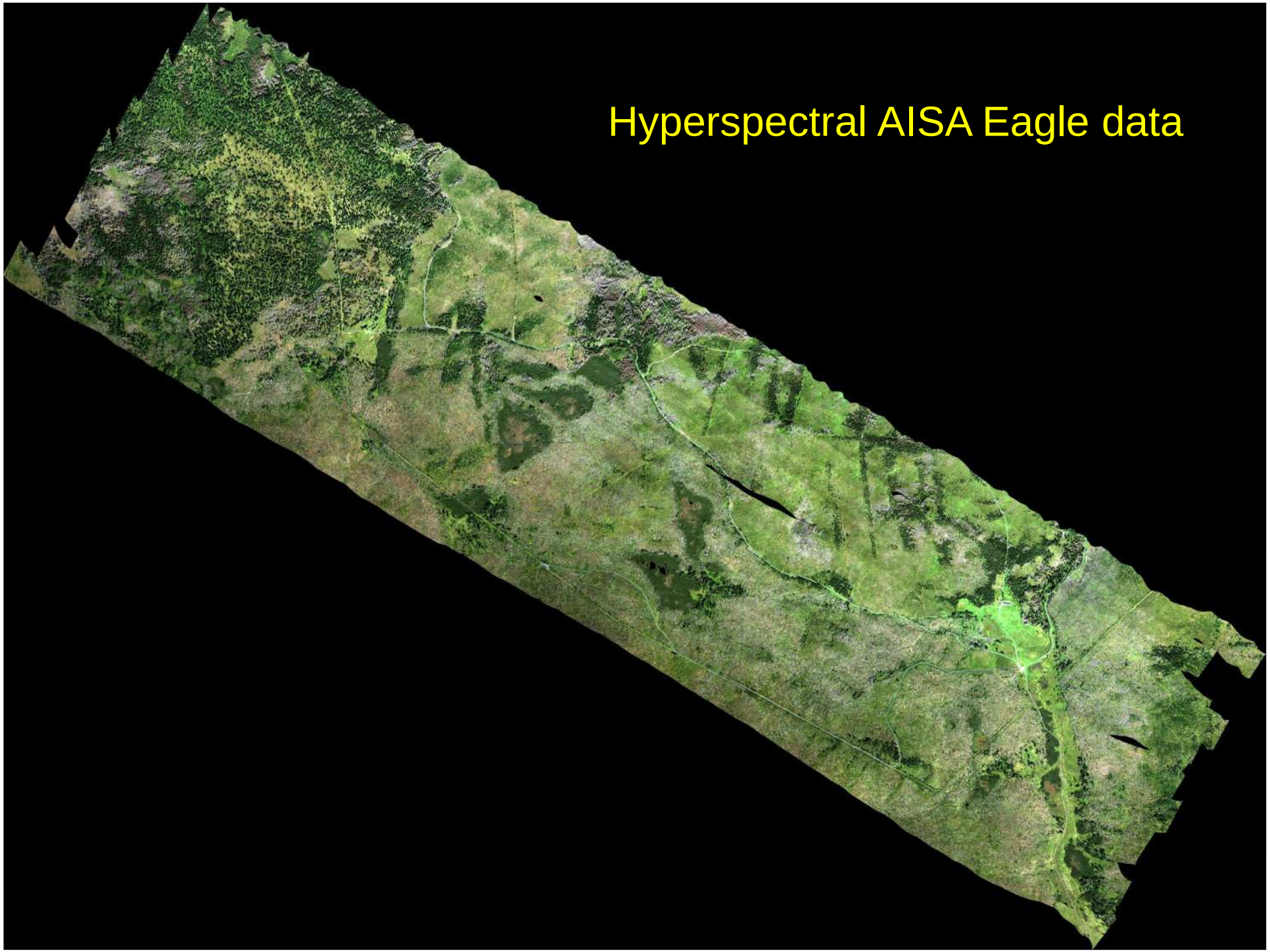
Clear cuts and forest plantations

Mixed and broad-leaved forest

Field measuments in support of airborne data acquisitions.



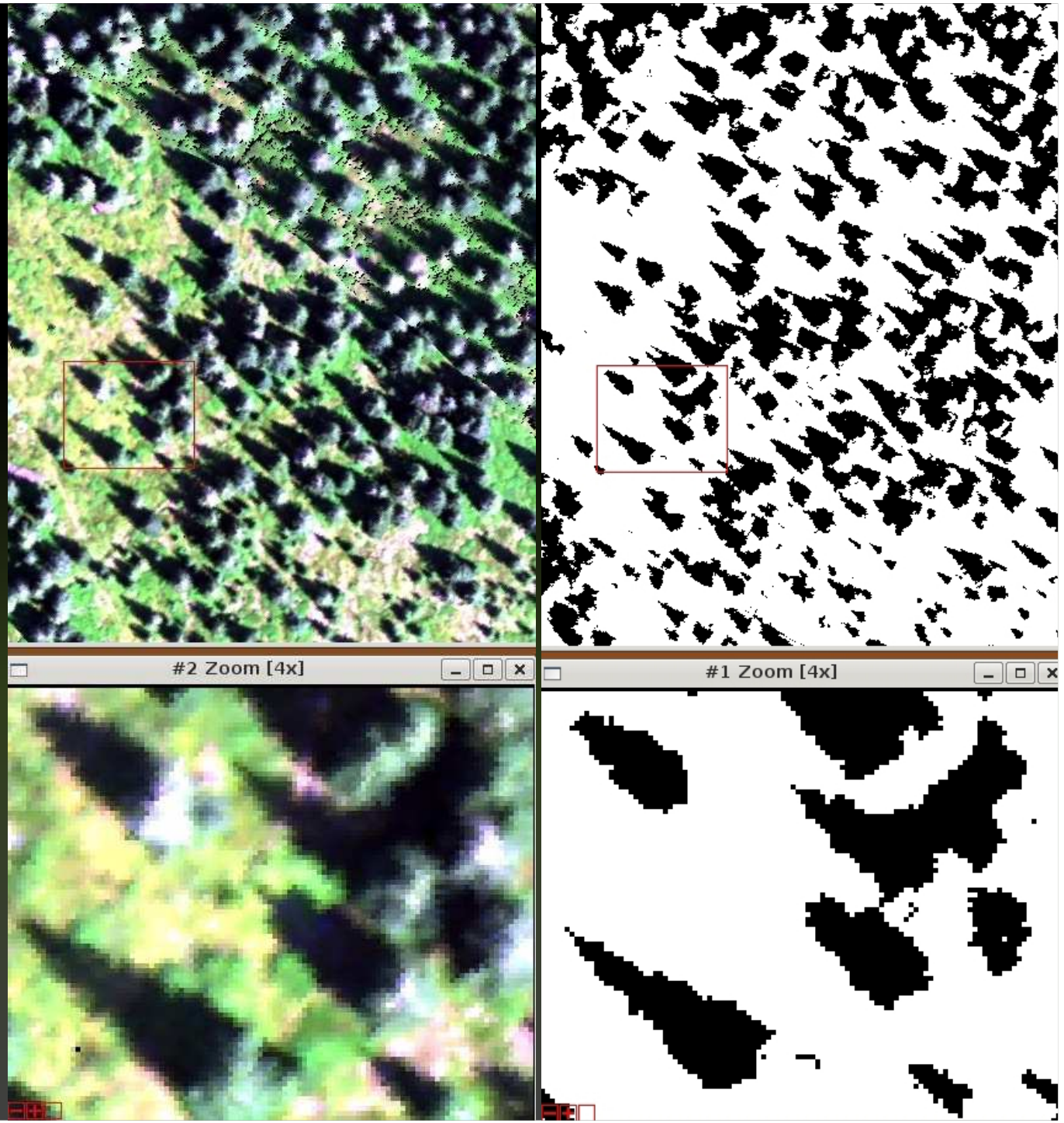

Plots for classification training and monitoring regeneration
P4
M4
P3
S4
S3
S8
M1
S7
M5
P2
S5
P5
M2
P1
M3
S6
S1
S2
S-waterlogged Norway spruce
M – Norway spruce forest without intervention
P – clear cuts


Hyperspectral AISA Eagle data

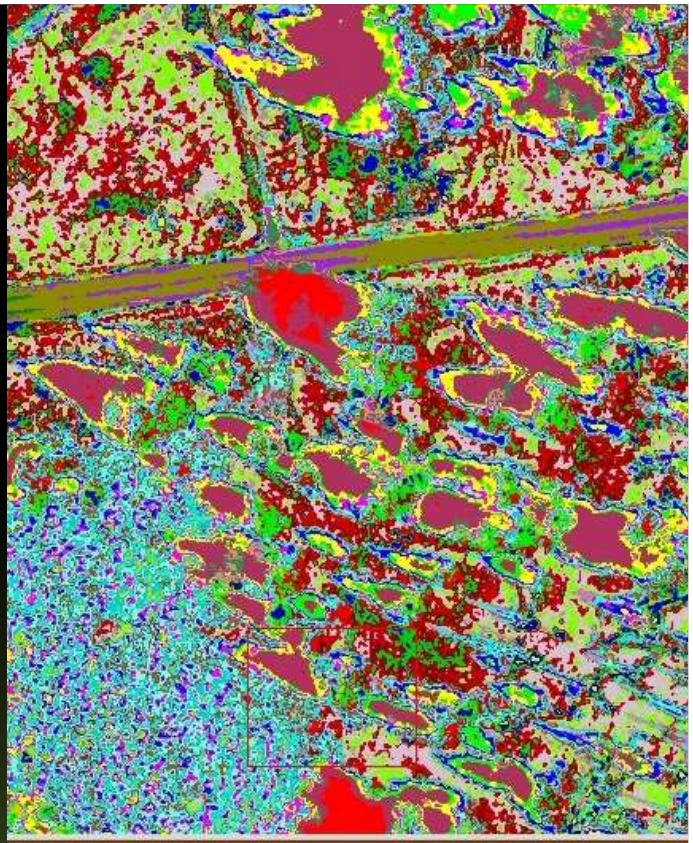
Classifications in Heterogeneous Forest Cover

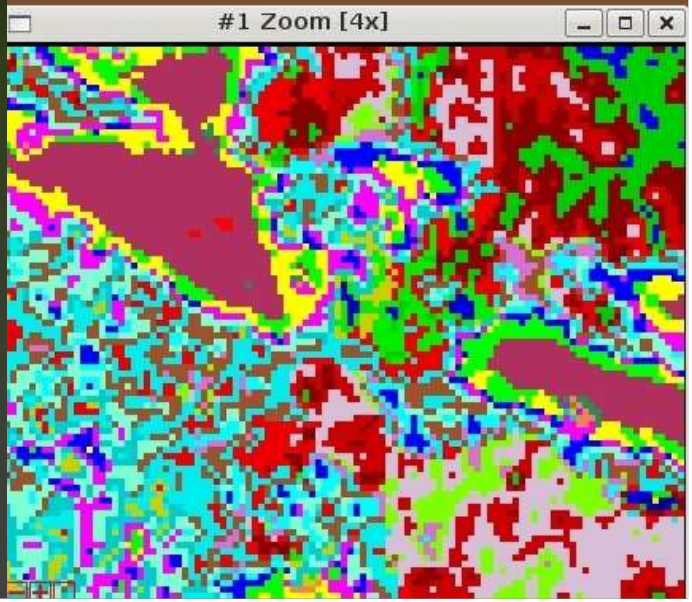
- Exploitation of different image segmentation strategies on airborne hyperspectral, Color IR and LiDAR data
  - Seek to identify mature trees, young trees and their species, shrubs, standing and fallen dead trees
- Different pixel sizes and spectral resolutions
  - Challenge of coregistration at cm scale

AISA 40 cm

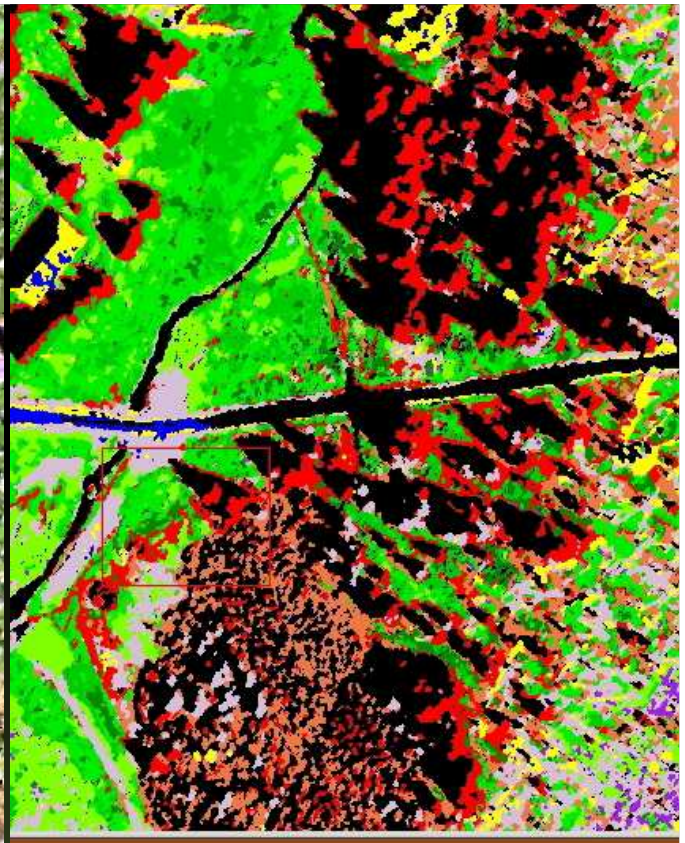


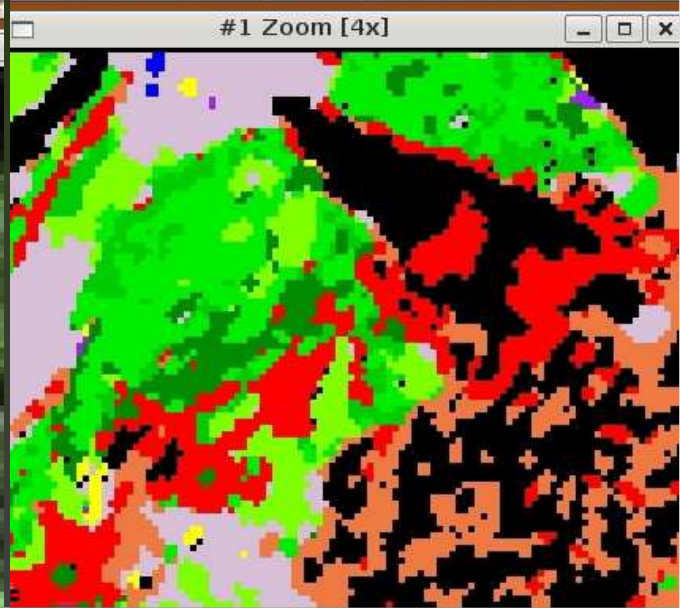
CIR 20 cm



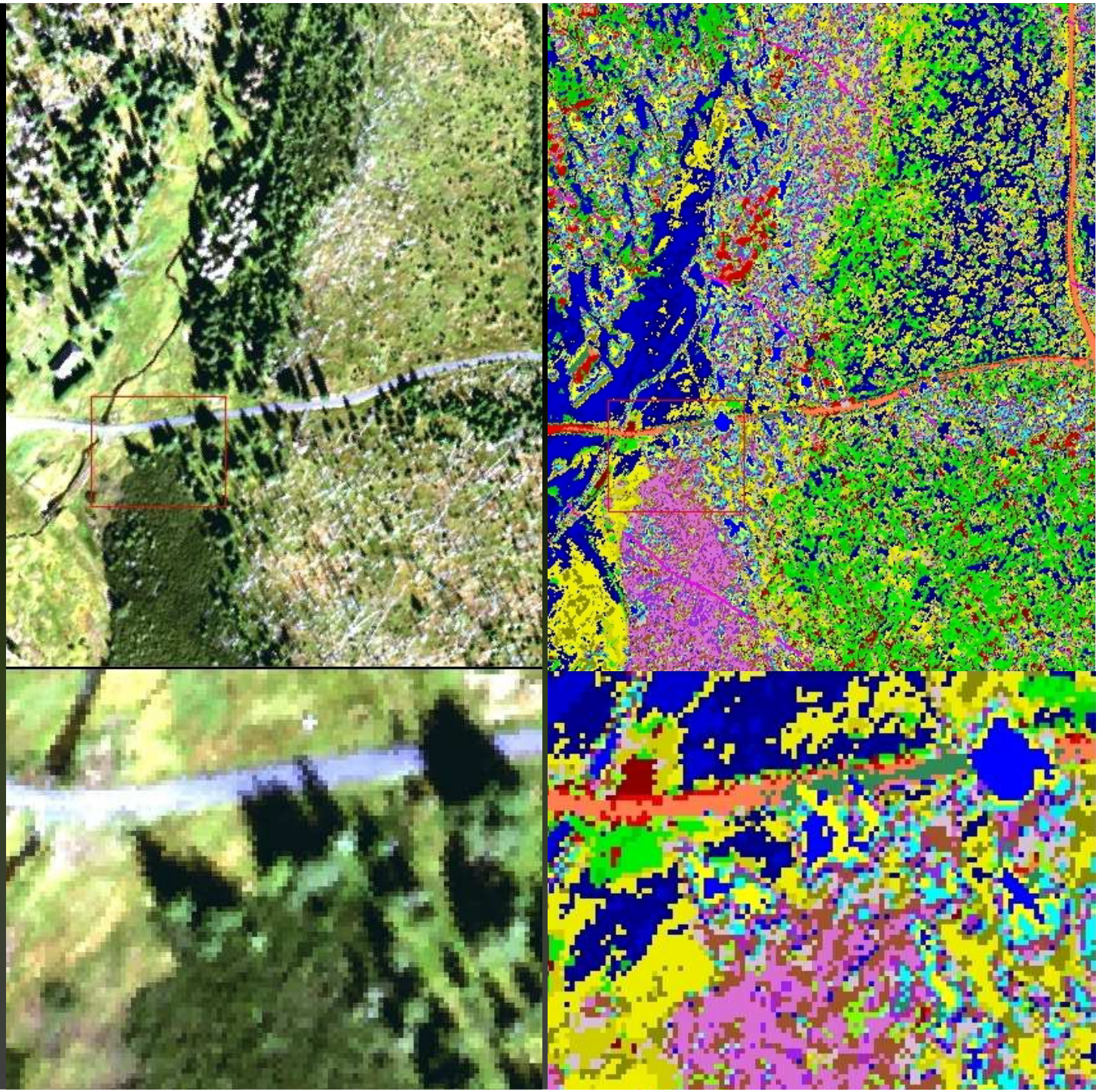


AISA 40 cm

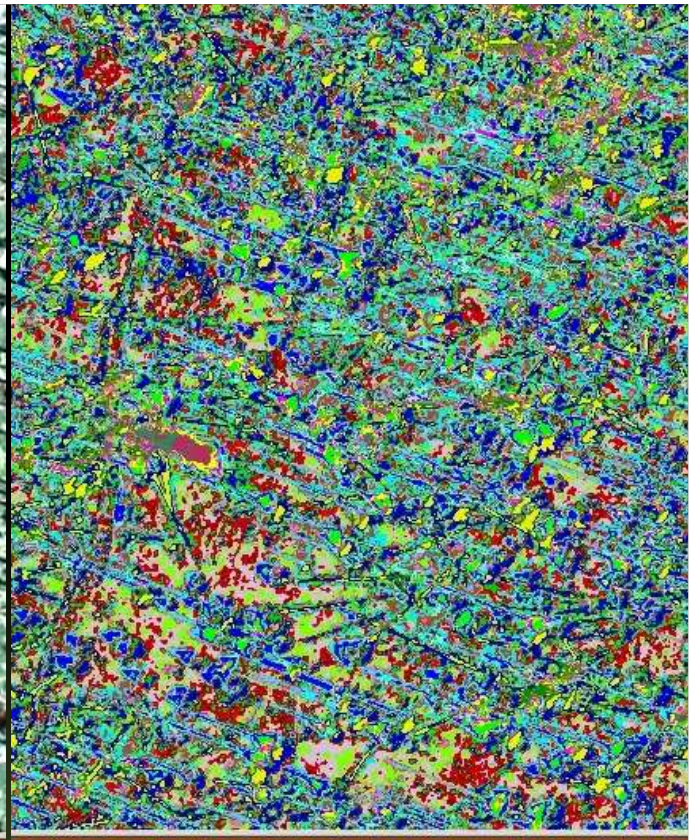


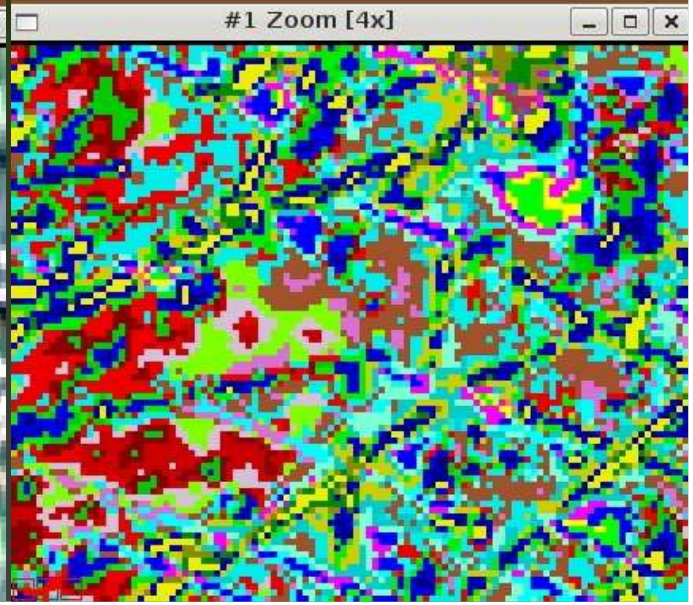


AISA 80 cm

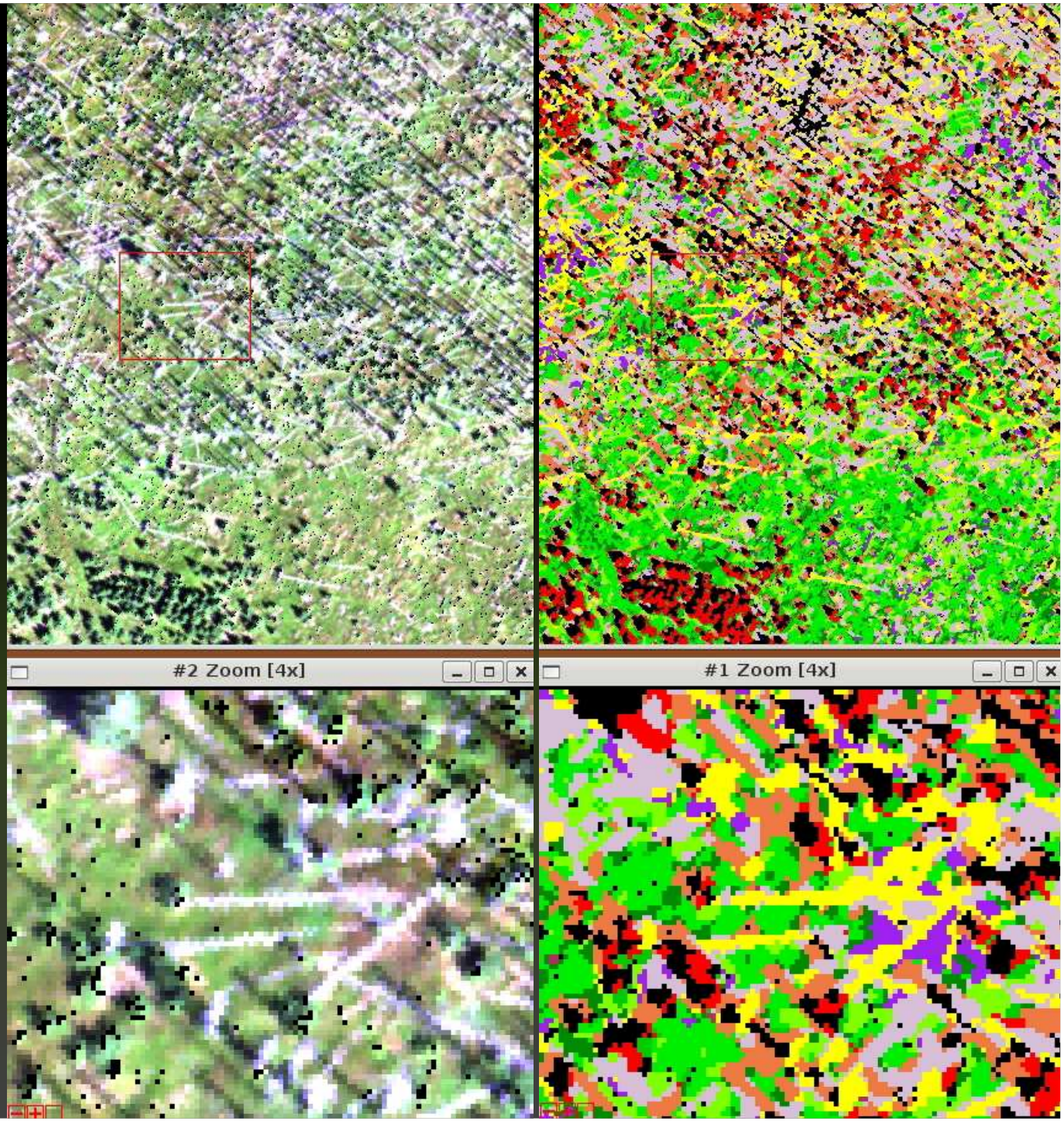


CIR 20 cm

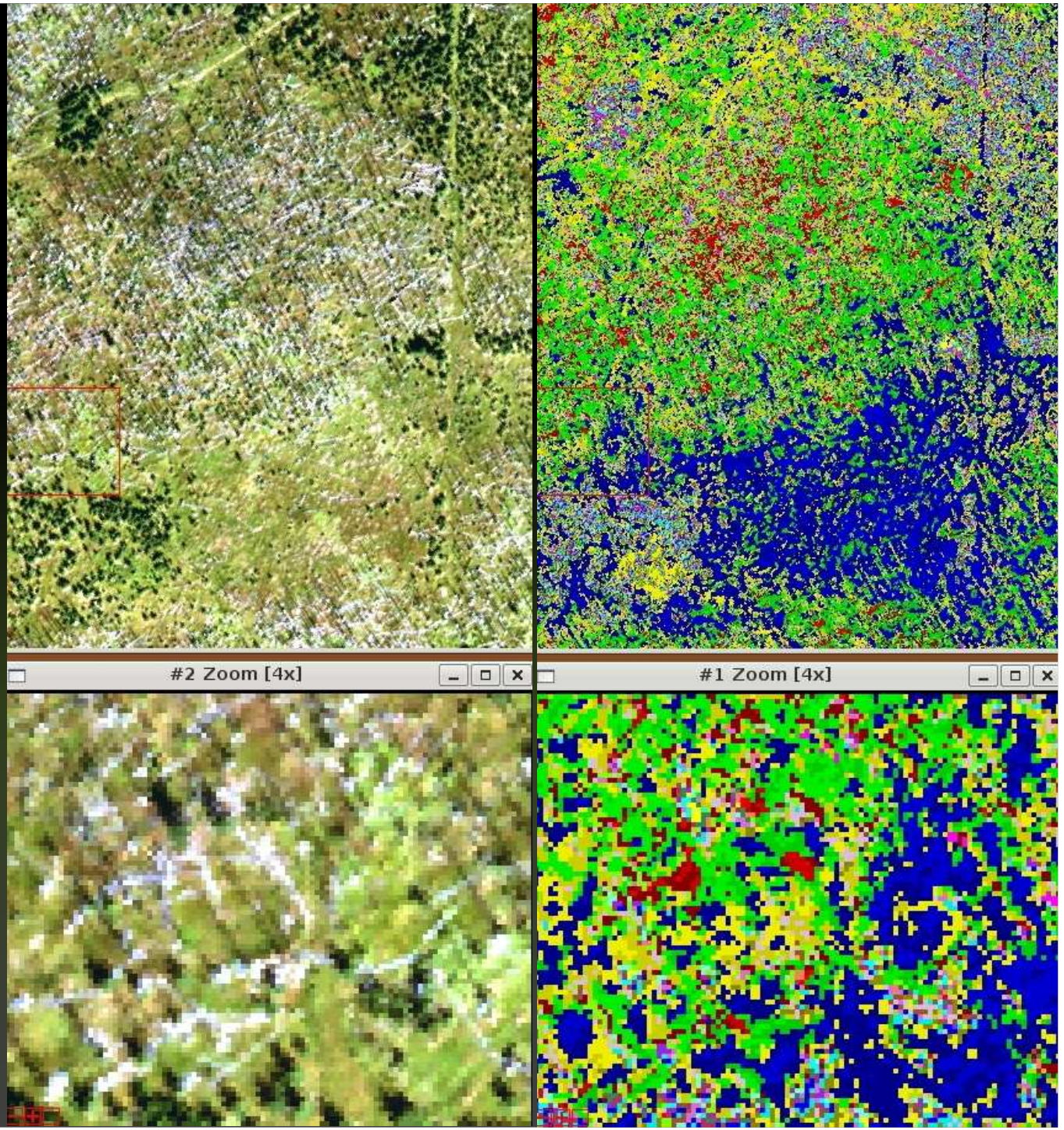




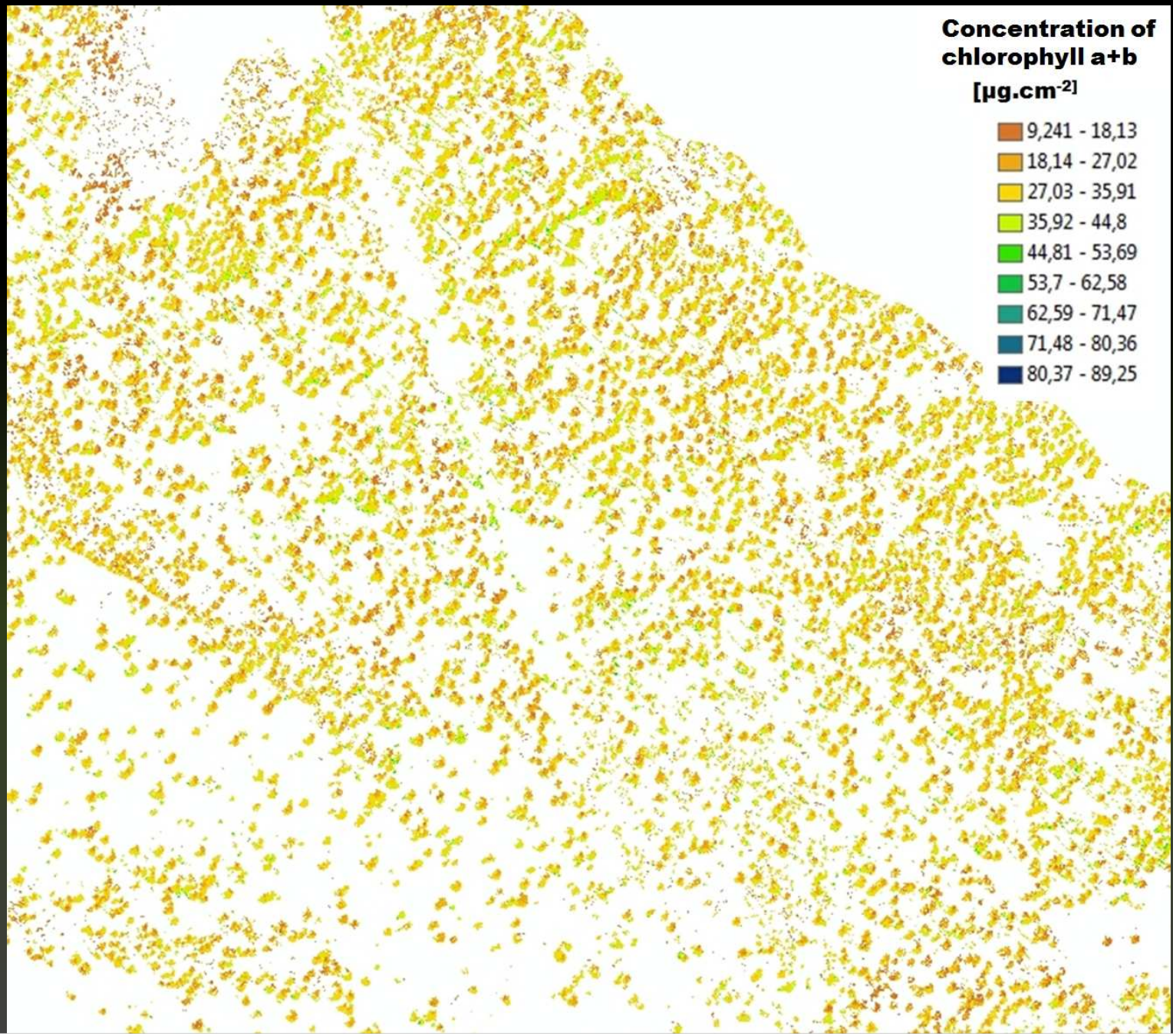
AISA 40 cm



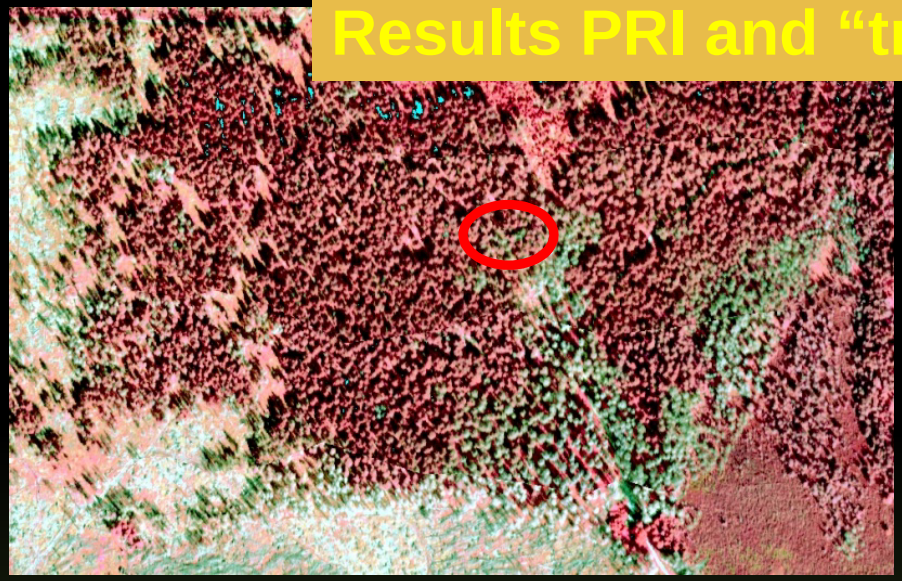
AISA 80 cm



Result - chlorophyll map

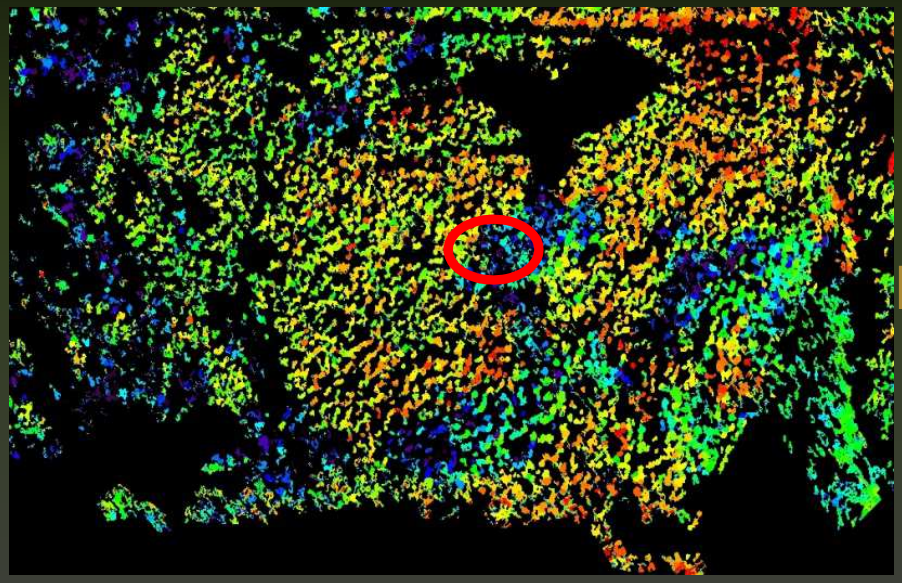


Results PRI and “tree candidates for dead”

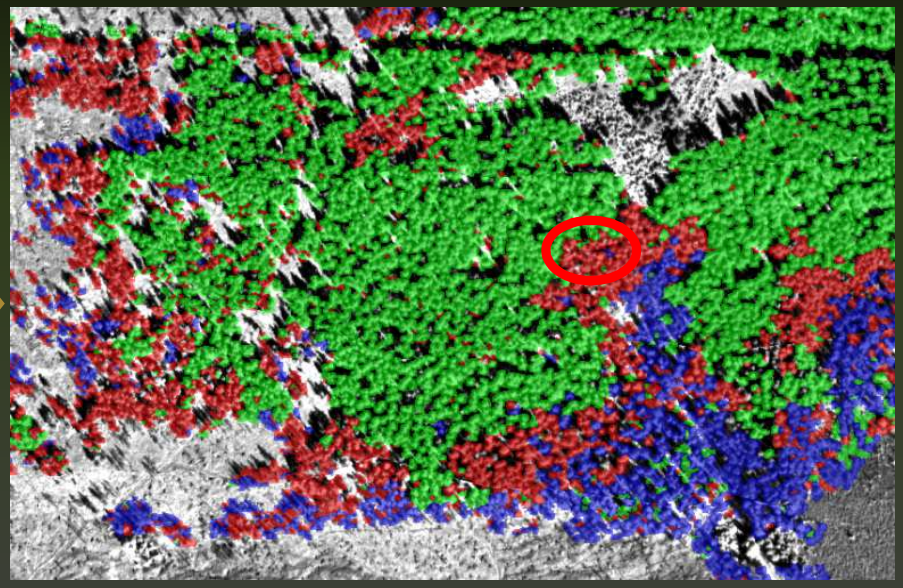


09 / 2009 AISA DUAL

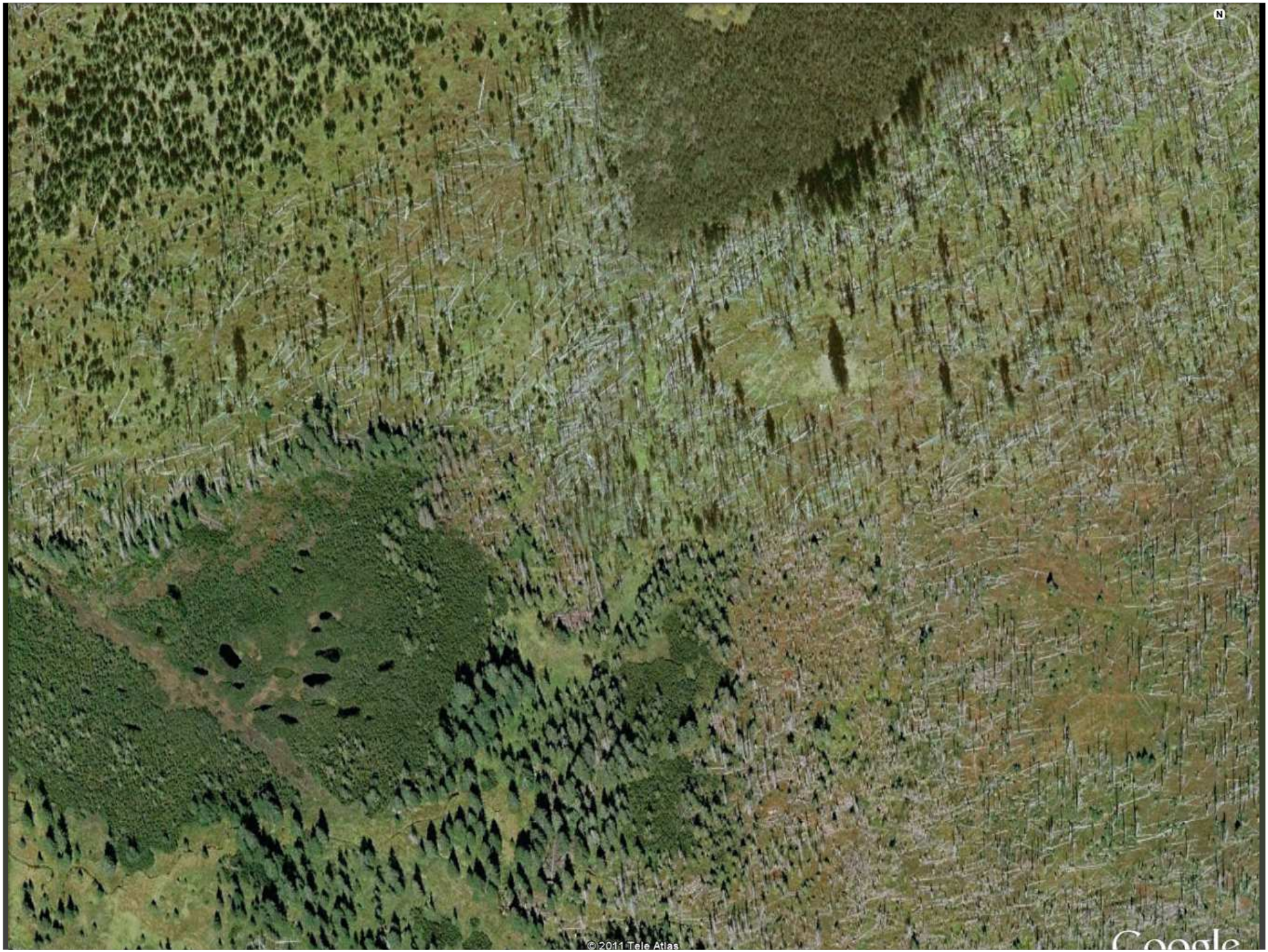
07 / 2010 Vextel UltraCam X



09 / 2009 PRI index of Norway spruce crowns



Classification from PRI index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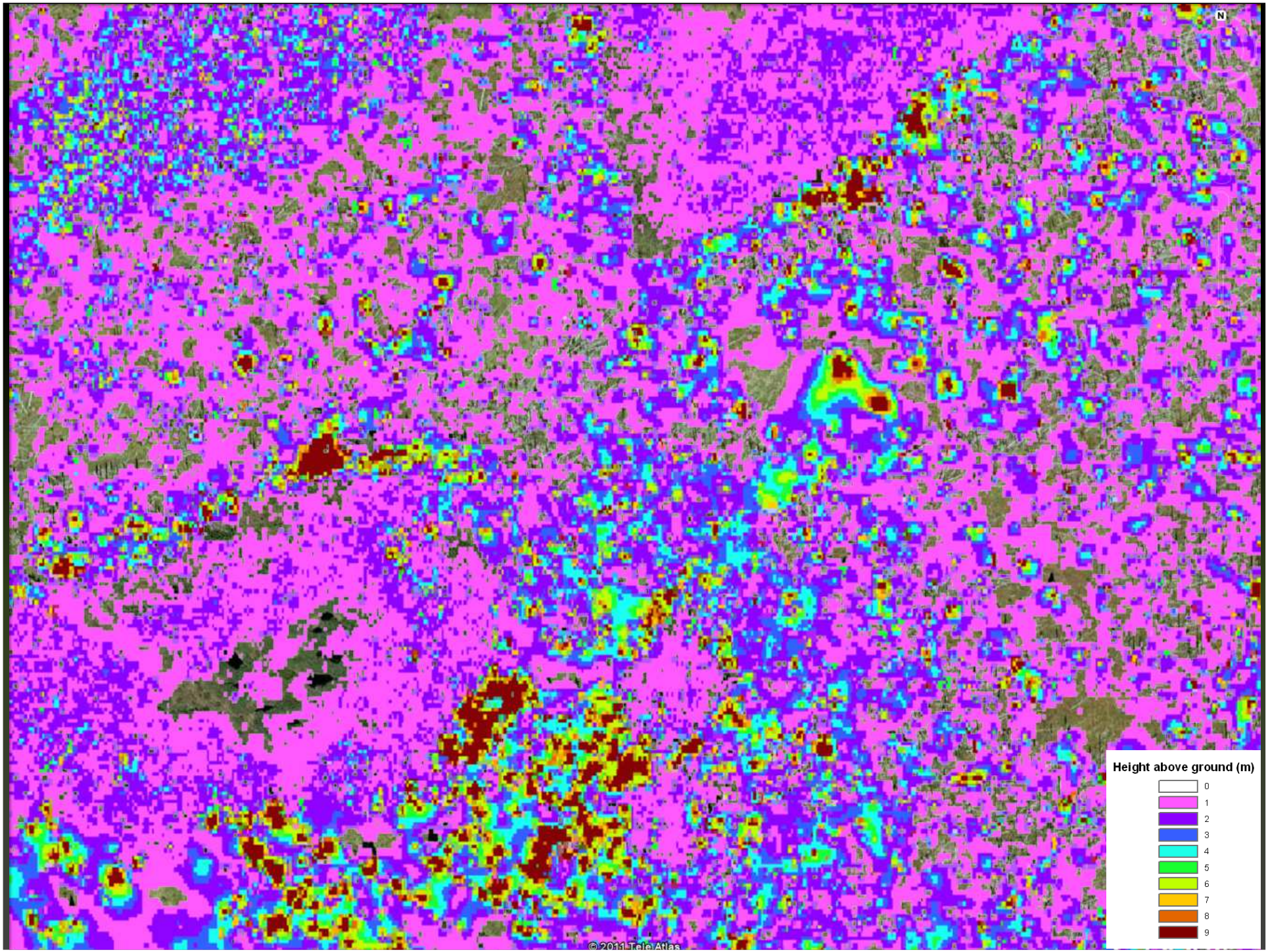
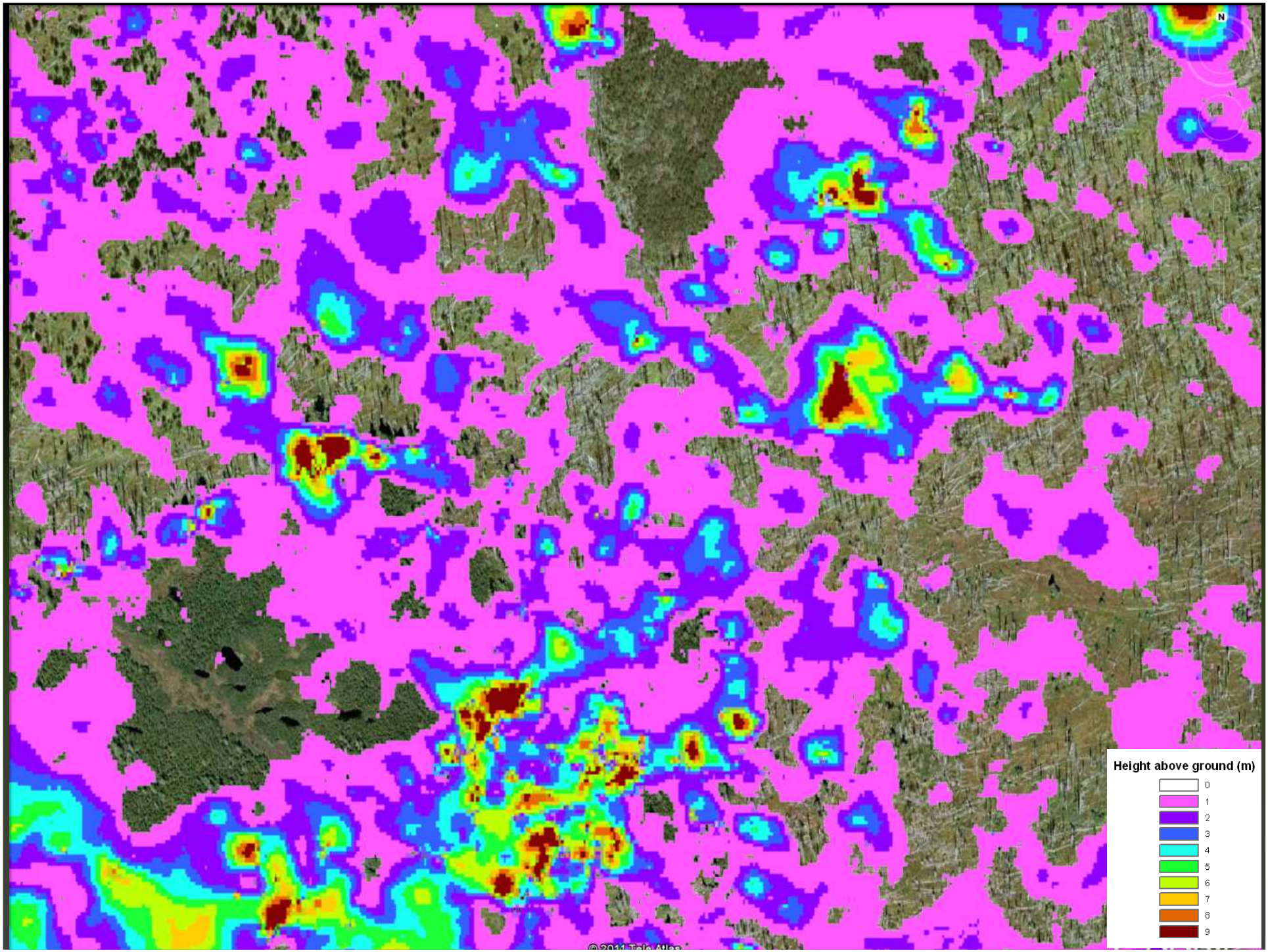
© 2011 Tele Atlas
Google


N
Height above ground (m)
0
1
2
3
4
5
6
7
8
9
© 2011 Tele Atlas


N
Height above ground (m)
0
1
2
3
4
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6
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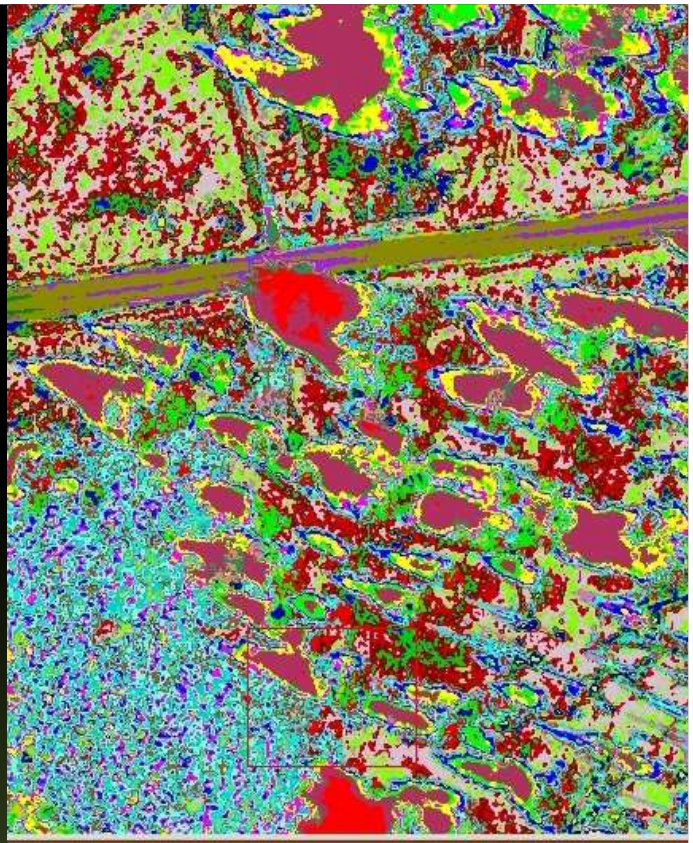
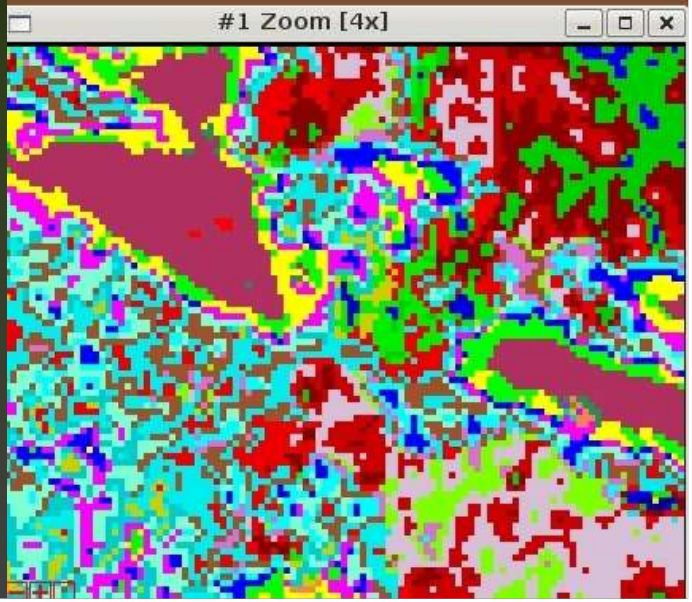
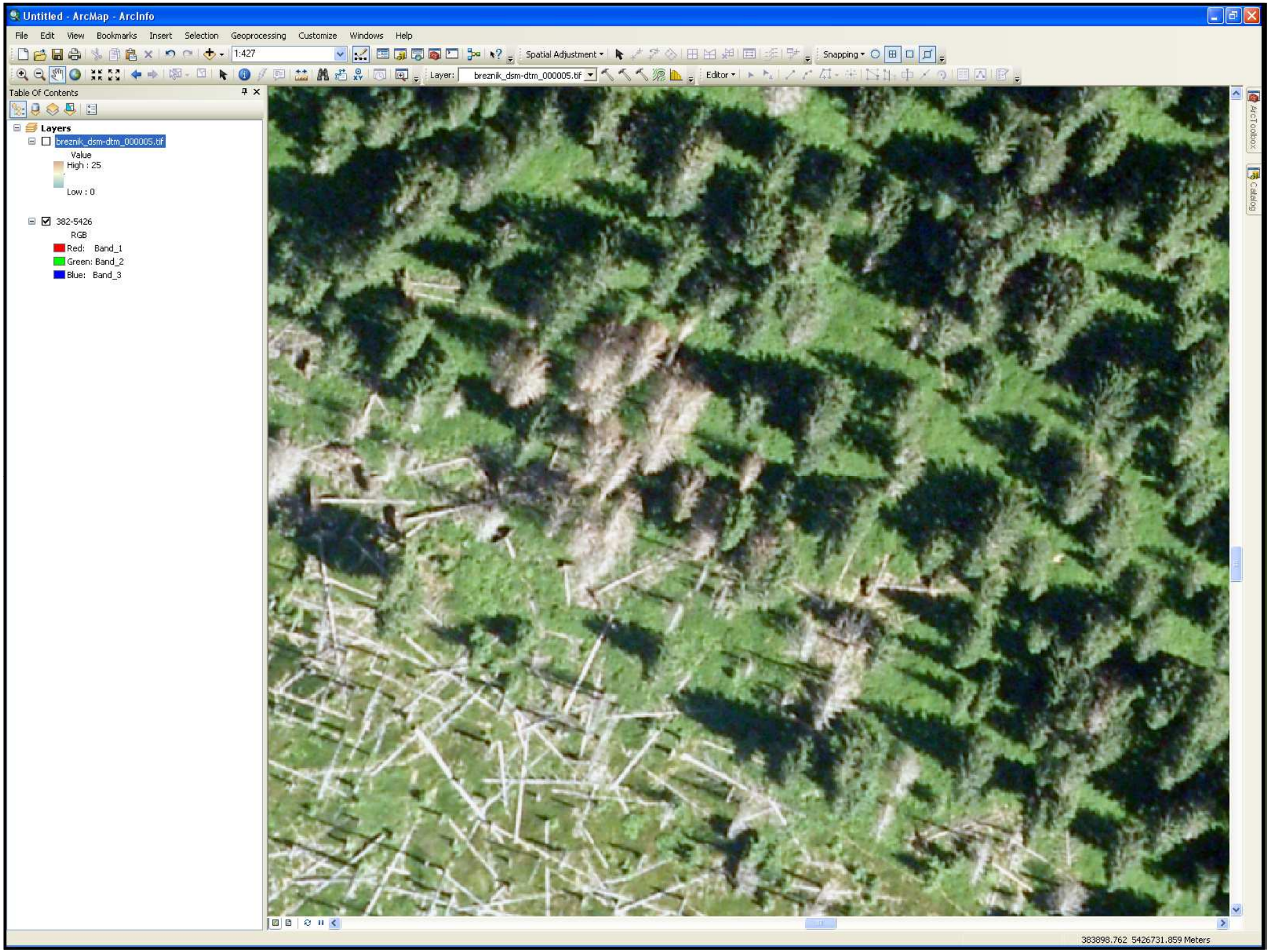
9
© 2011 Tele Atlas

CIR 20 cm



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Spatial Adjustment
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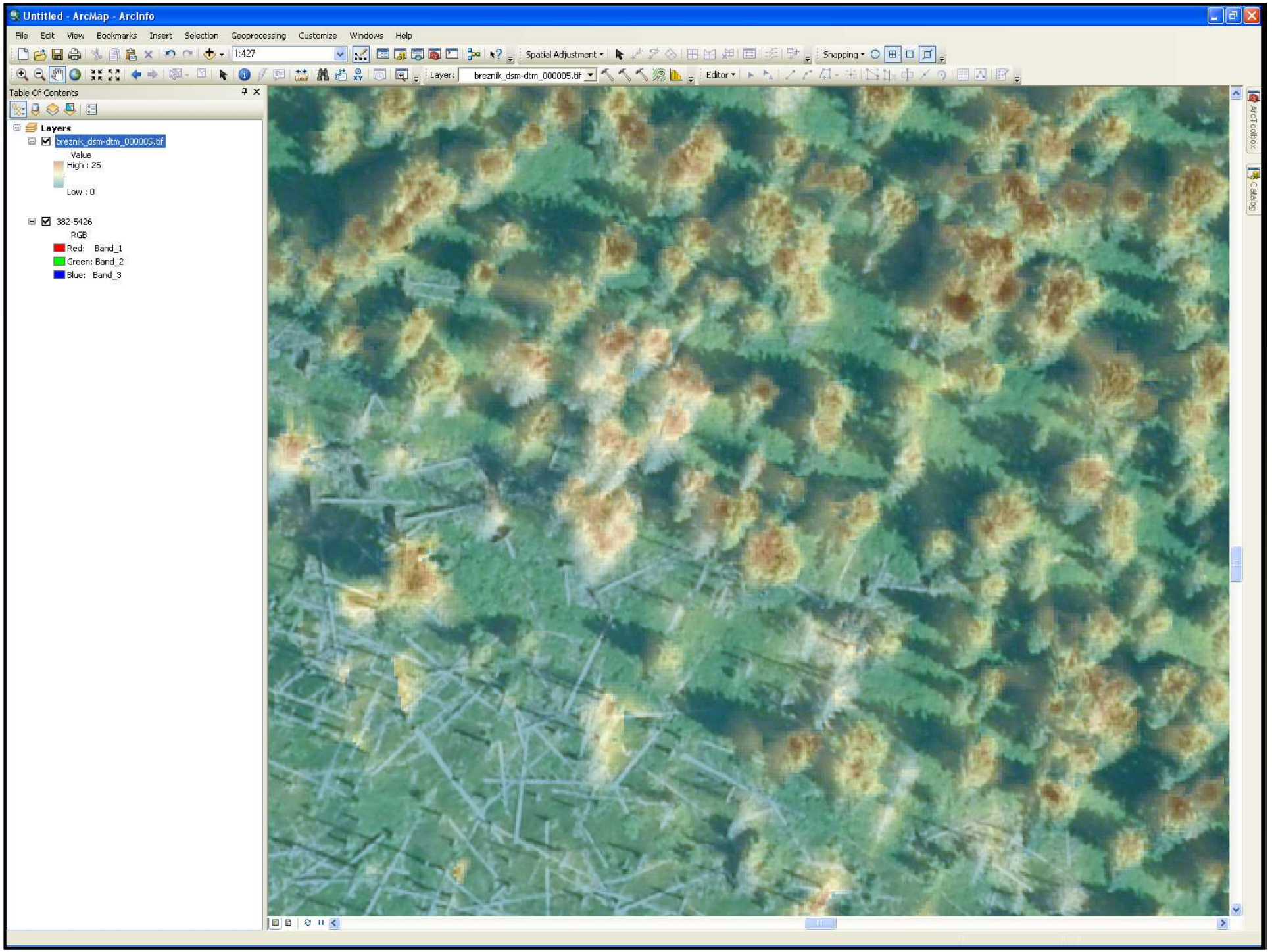
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Spatial Adjustment
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Value
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382-5426
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
ArcToolbox
Catalog

Future Steps

- Seeking measures through which we can quantify regeneration under very heterogeneous forest cover
- Next phase: application of most promising data and methods for the region; field verification; refinement of methods
  - Exploit LiDAR for information about canopy surface
  - Additional field measurement of spectral signatures for better training and verification of classifications
  - Combination (better coregistration) of LiDAR results (CHM) and CIR/HS in NN/OO classifications
- Retrospective analysis – reprocess all Landsat scenes with improved pre-processing and classification methodology