Harnessing Citizen Science and Remote Sensing for Improved environmental monitoring

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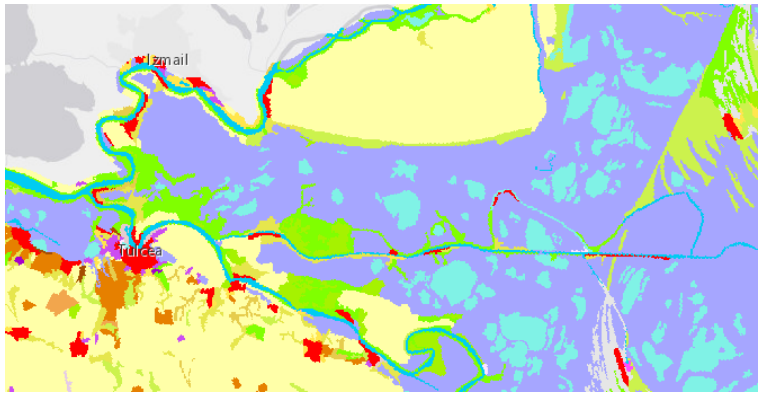
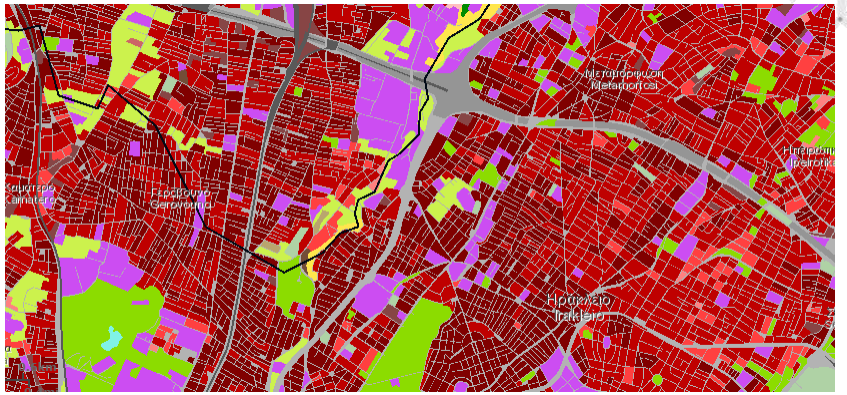
Motivation & need

- Need for automatic assessment and monitoring of LC/LU
- Importance to detect seasonal changes, natural disasters, and human-related area development
- Scarce updates of existing products, timely data validation procedures



Corine Land Cover product of 2012
for Danube Delta-Romania,
[Source: EEA]



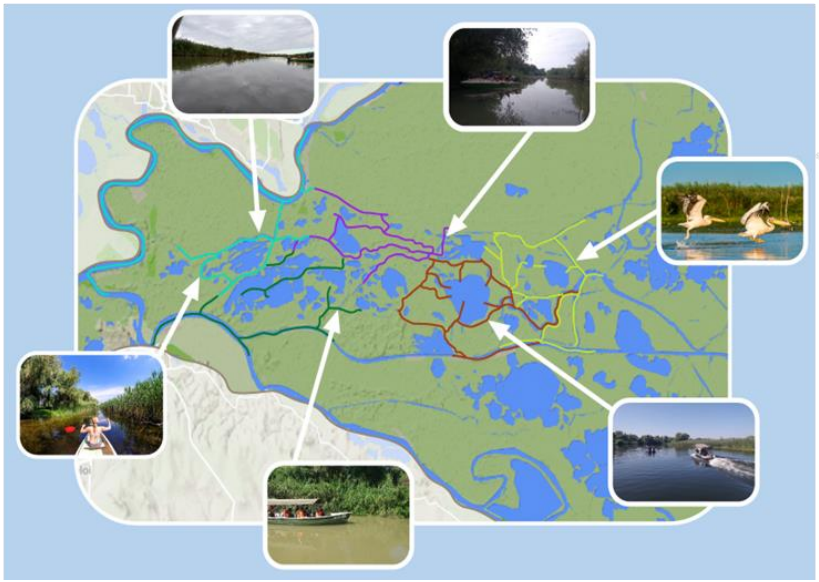
Urban Atlas product of 2012
for Kifisos Basin-Greece,
[Source: EEA]

H2020 Scent Citizen Observatory

H2020 Scent Citizen Observatory

Urban Pilot Area:
Kifisos river basin, Attica, Greece

Rural Pilot Area:
Danube Delta, Tulcea, Romania



Scent Map Segmentation, Delineation, Characterization and Annotation tool

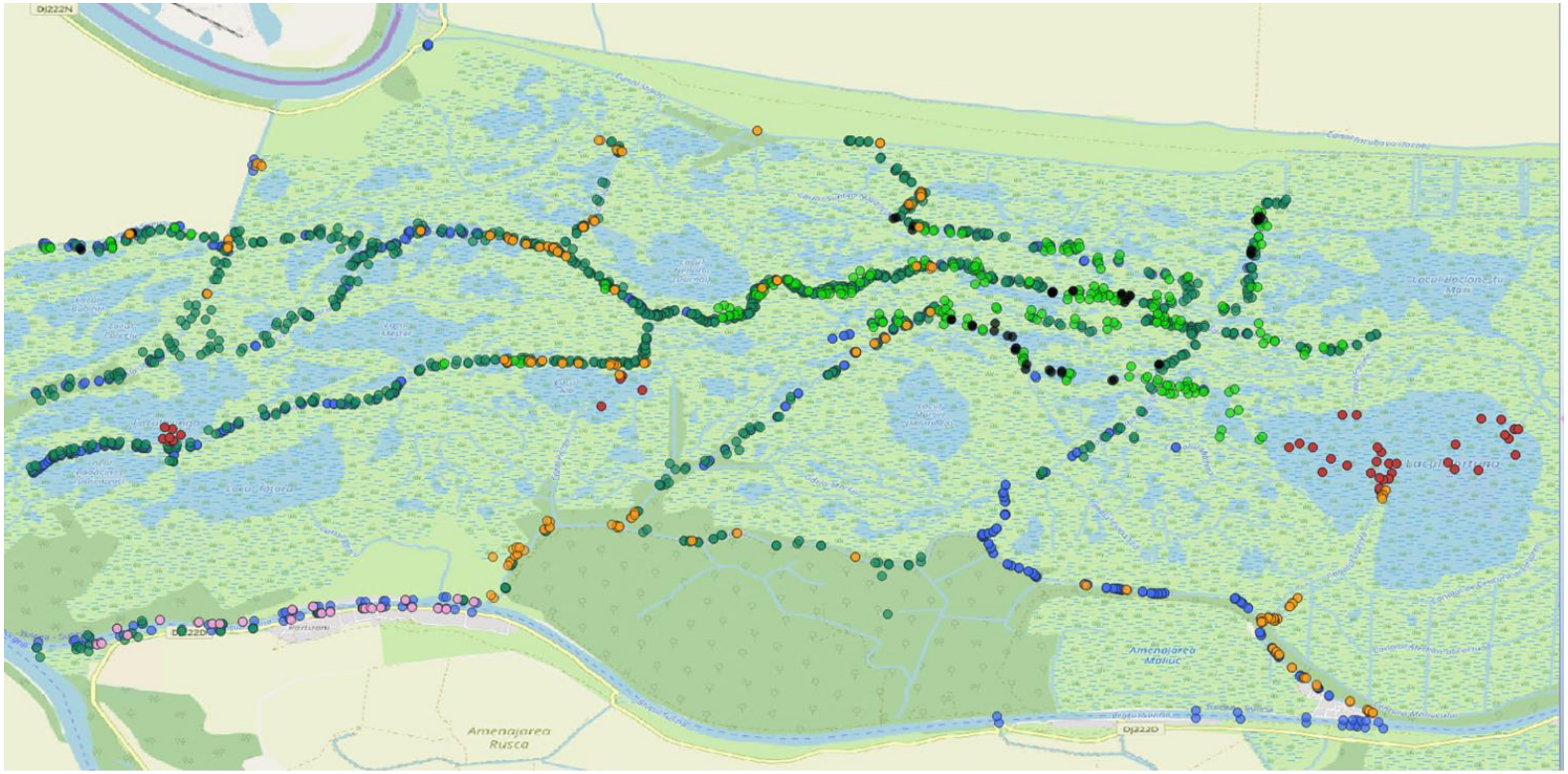
- Assign a semantic class (Scent taxonomy) to each pixel, (i.e. convert the raw data to a semantically meaningful raster map),
- Convert Scent taxonomy annotated points into annotated areas on the satellite/aerial maps and,
- Characterize whole areas for which a land-cover/use description is not available.

Pixel-wise semantic segmentation

Training data generation

Training data generation

Crowdsourced data (Danube Delta)



Examples of data tiles

Reeds (standard)

Reeds (dark)

Reeds (shiny green)

Shrubs / forest

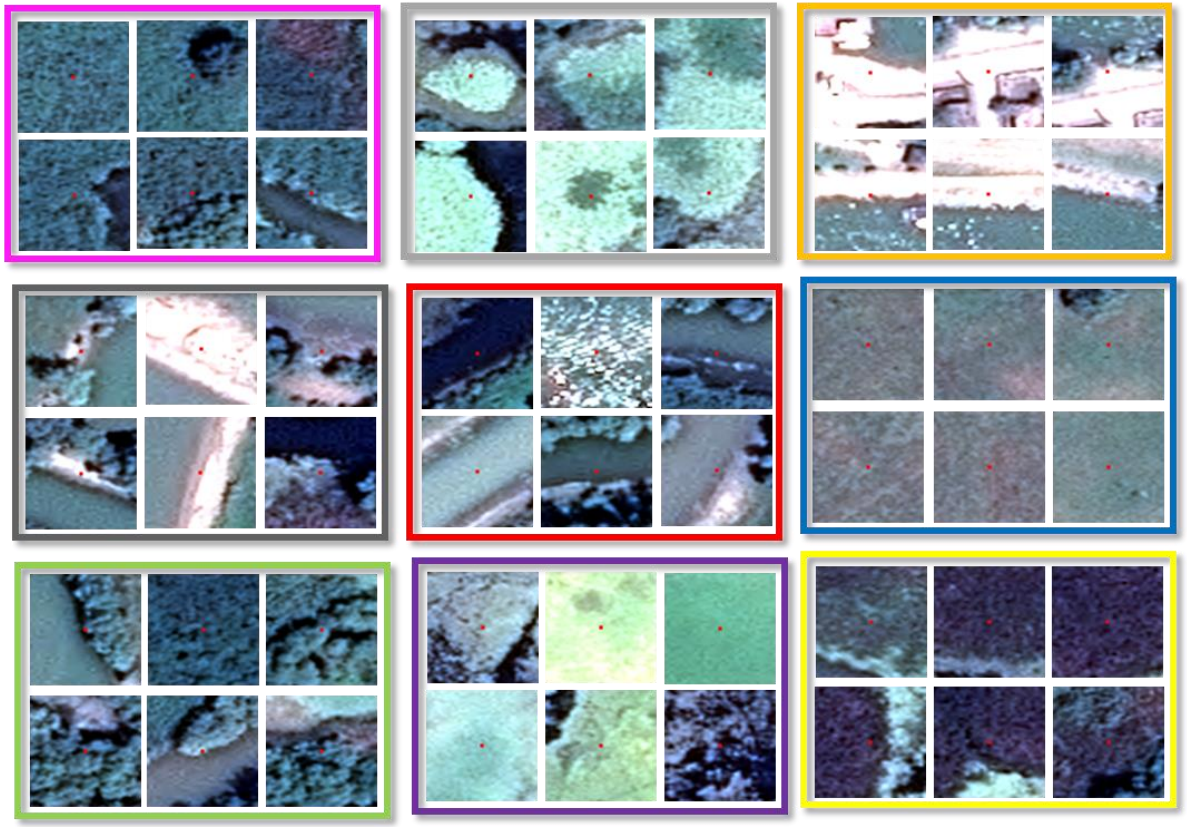
Bare soil

Inland Marsh

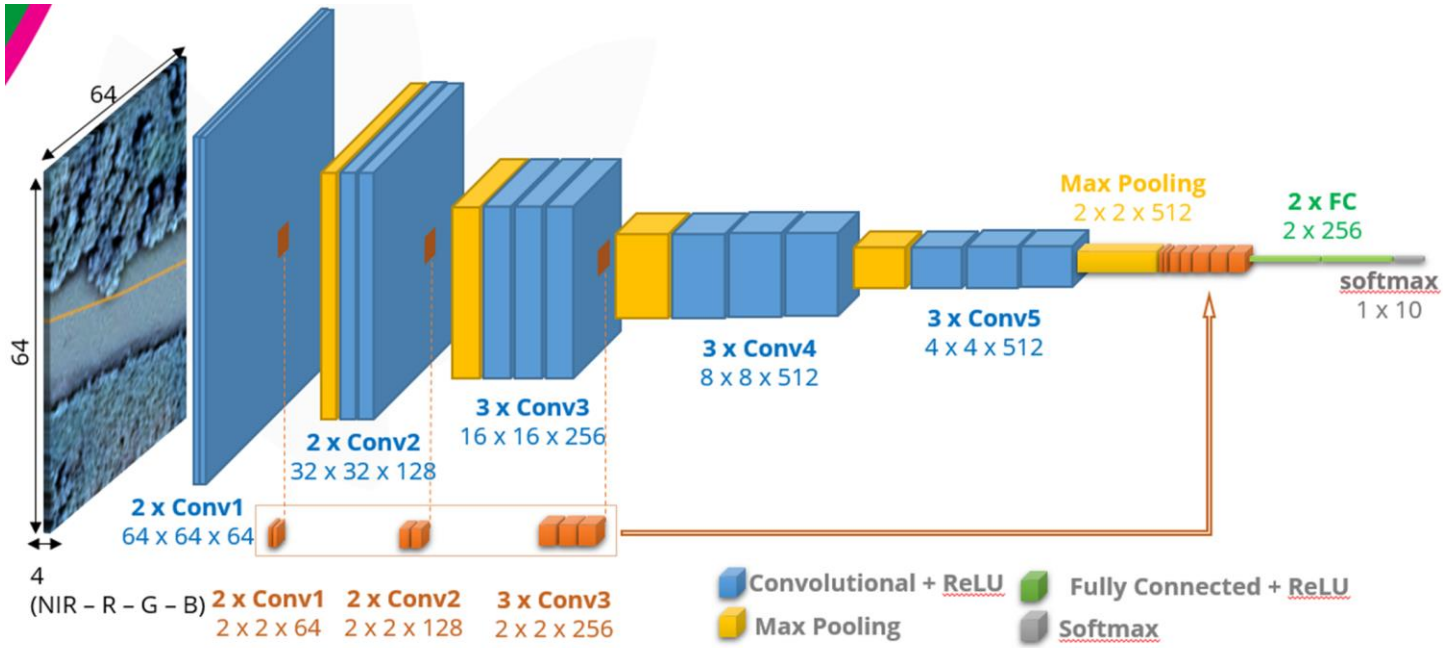
Concrete

Low grass

River



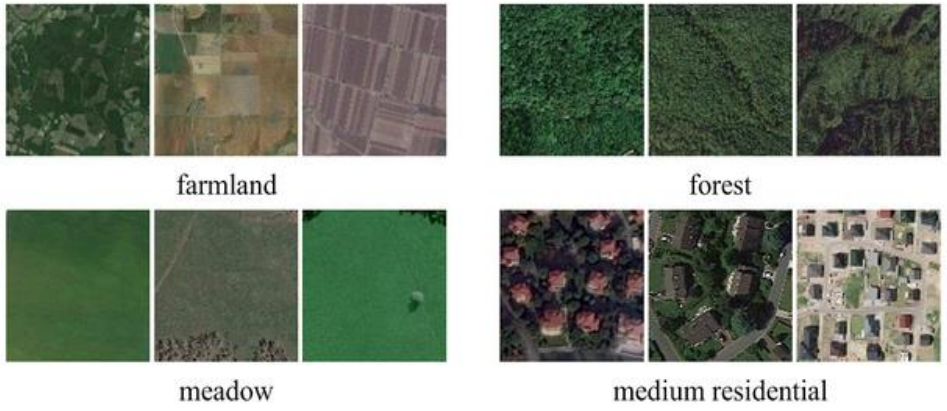
Scent Deep Neural Network Architecture



Scent DNN training strategy

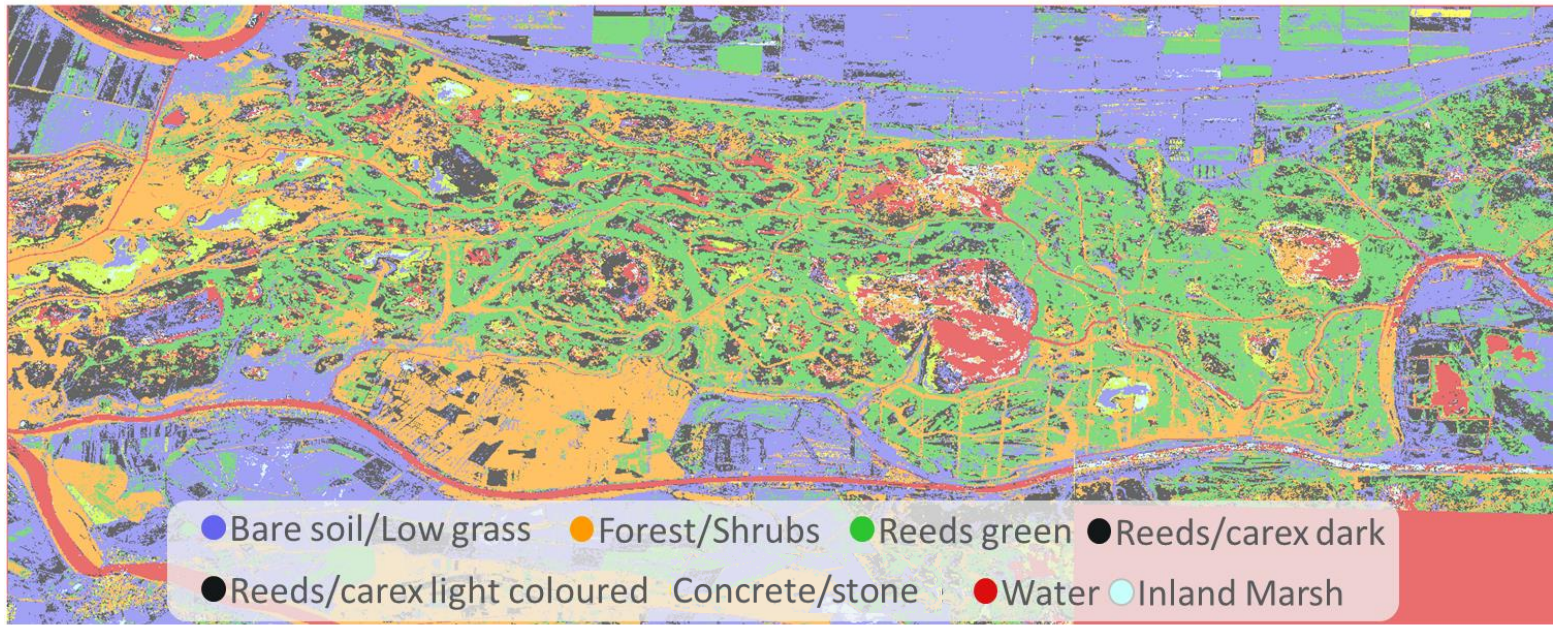
Train stage one: Image Net

Train stage two: High resolution satellite images

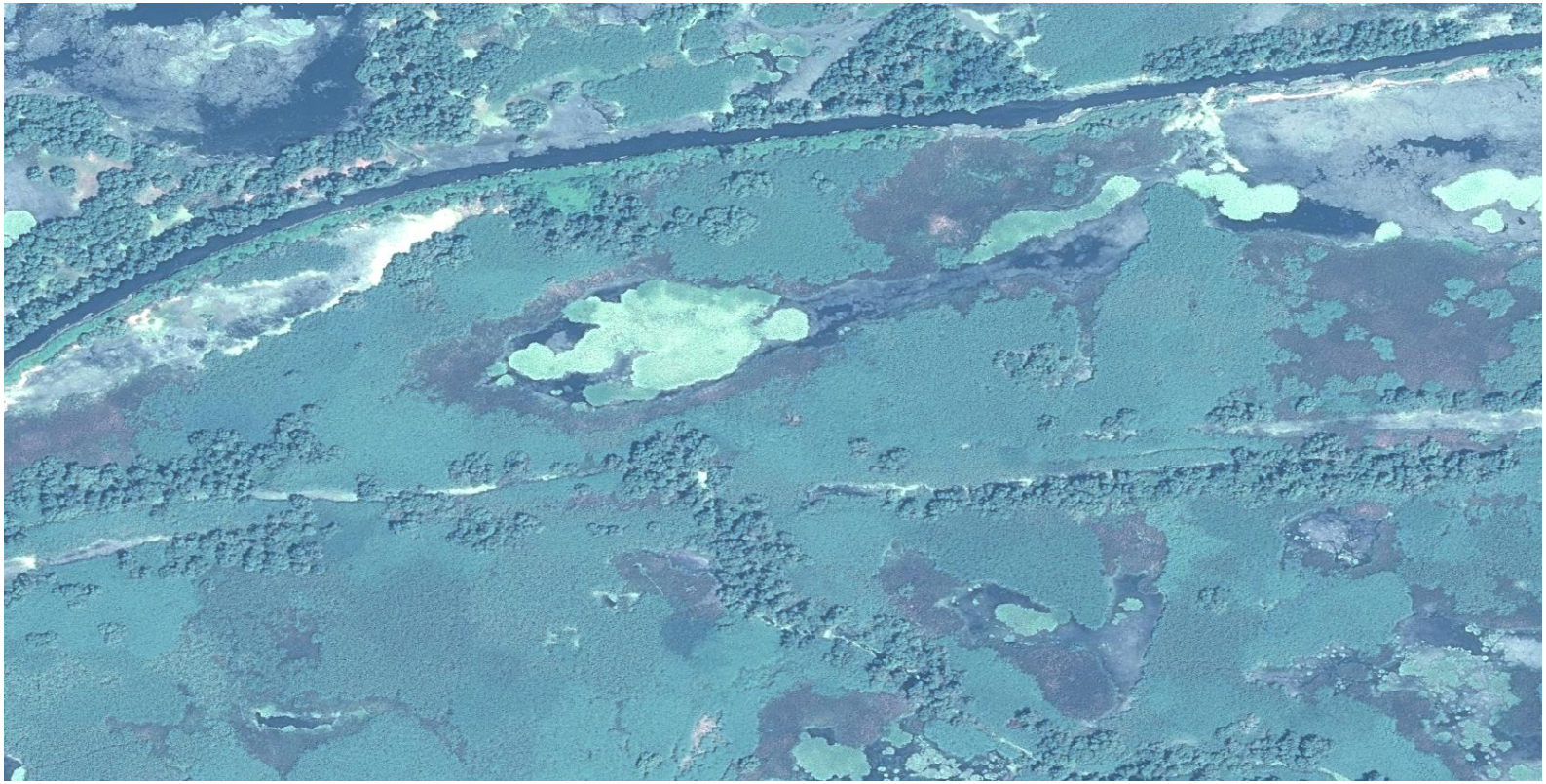


Train stage three: Last 3 layers were trained using augmented SCENT data

Results


Bare soil/Low grass
Forest/Shrubs
Reeds green
Reeds/carex dark
Reeds/carex light coloured
Concrete/stone
Water
Inland Marsh

Highlights



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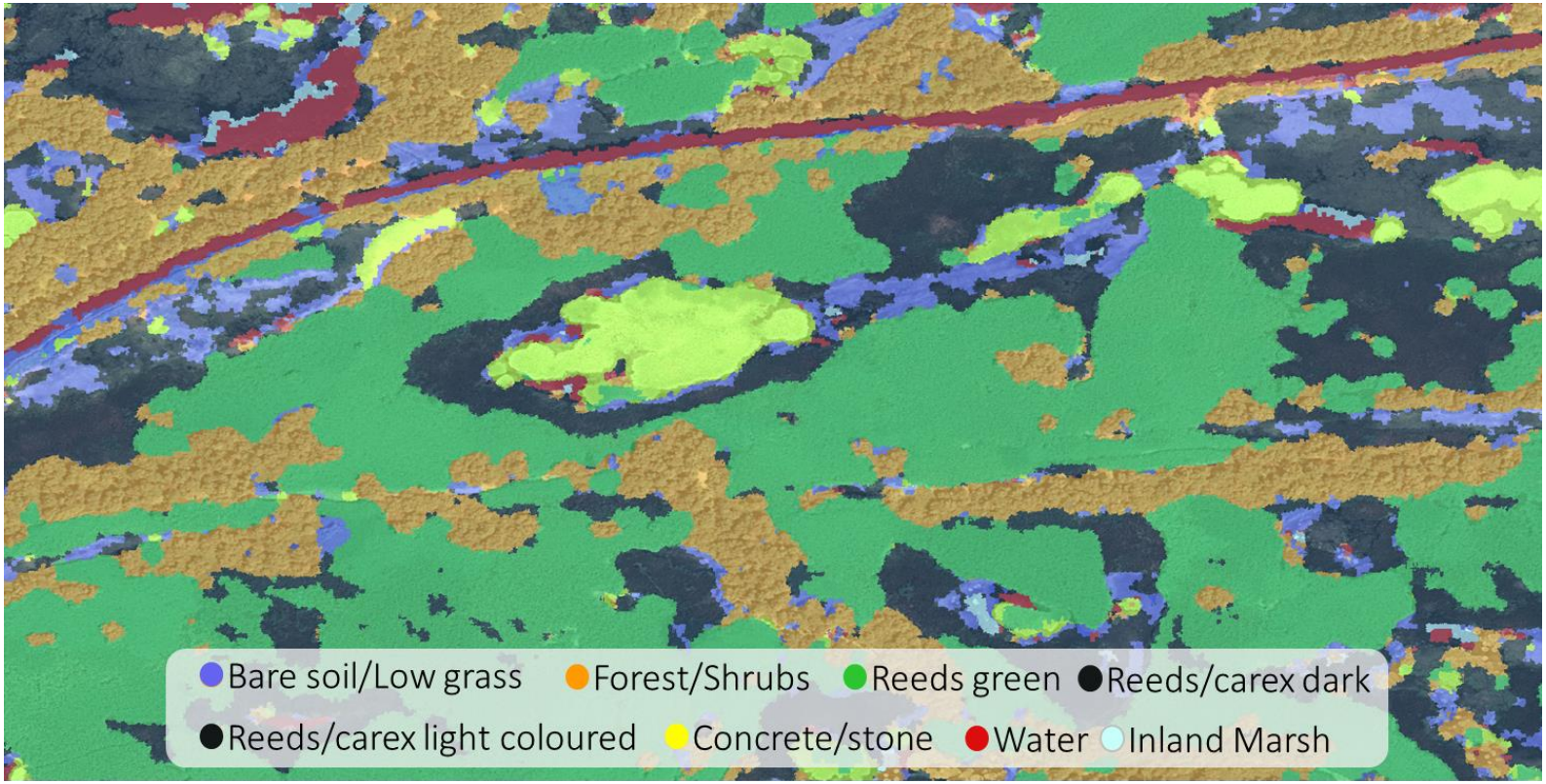
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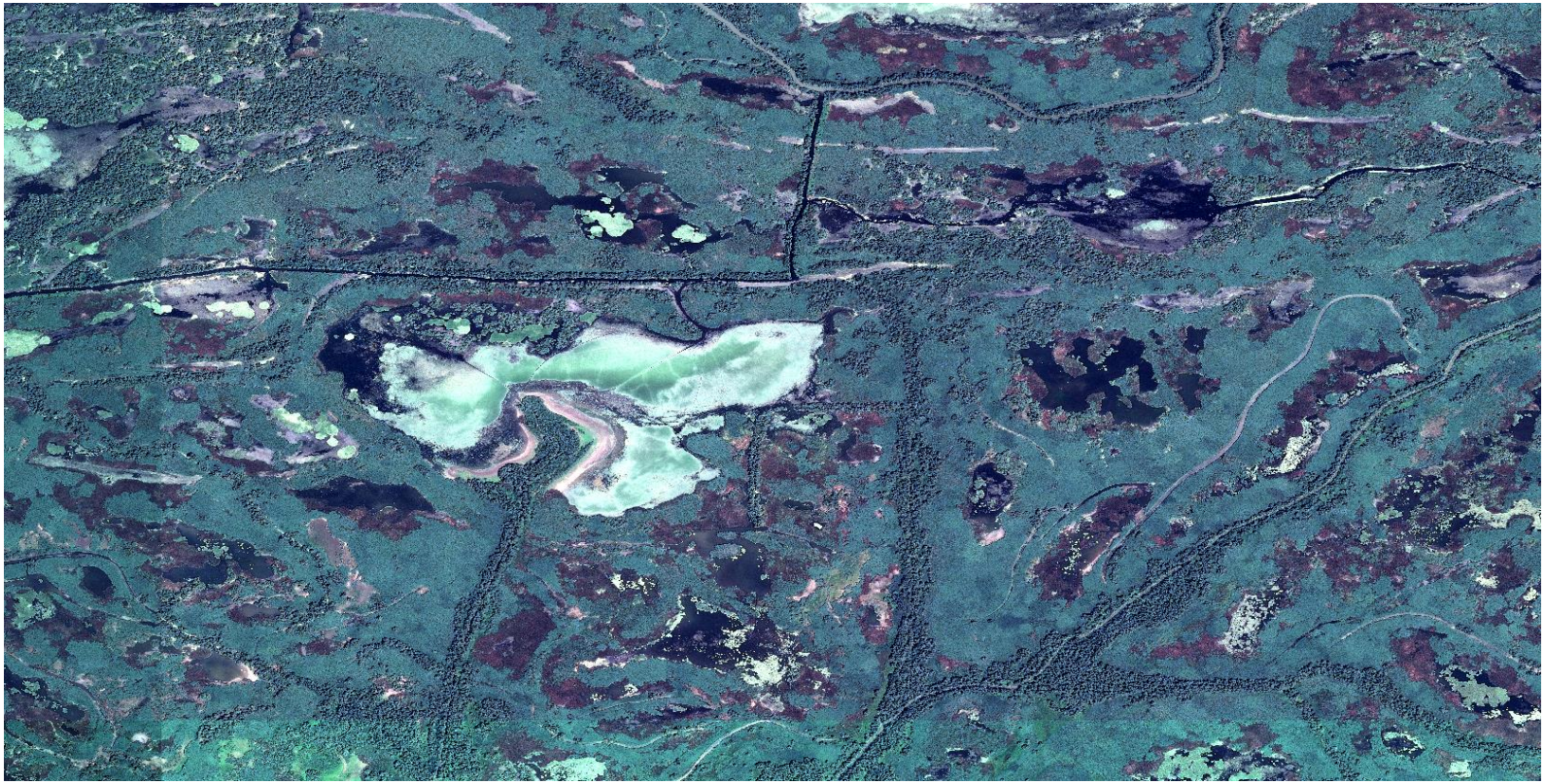

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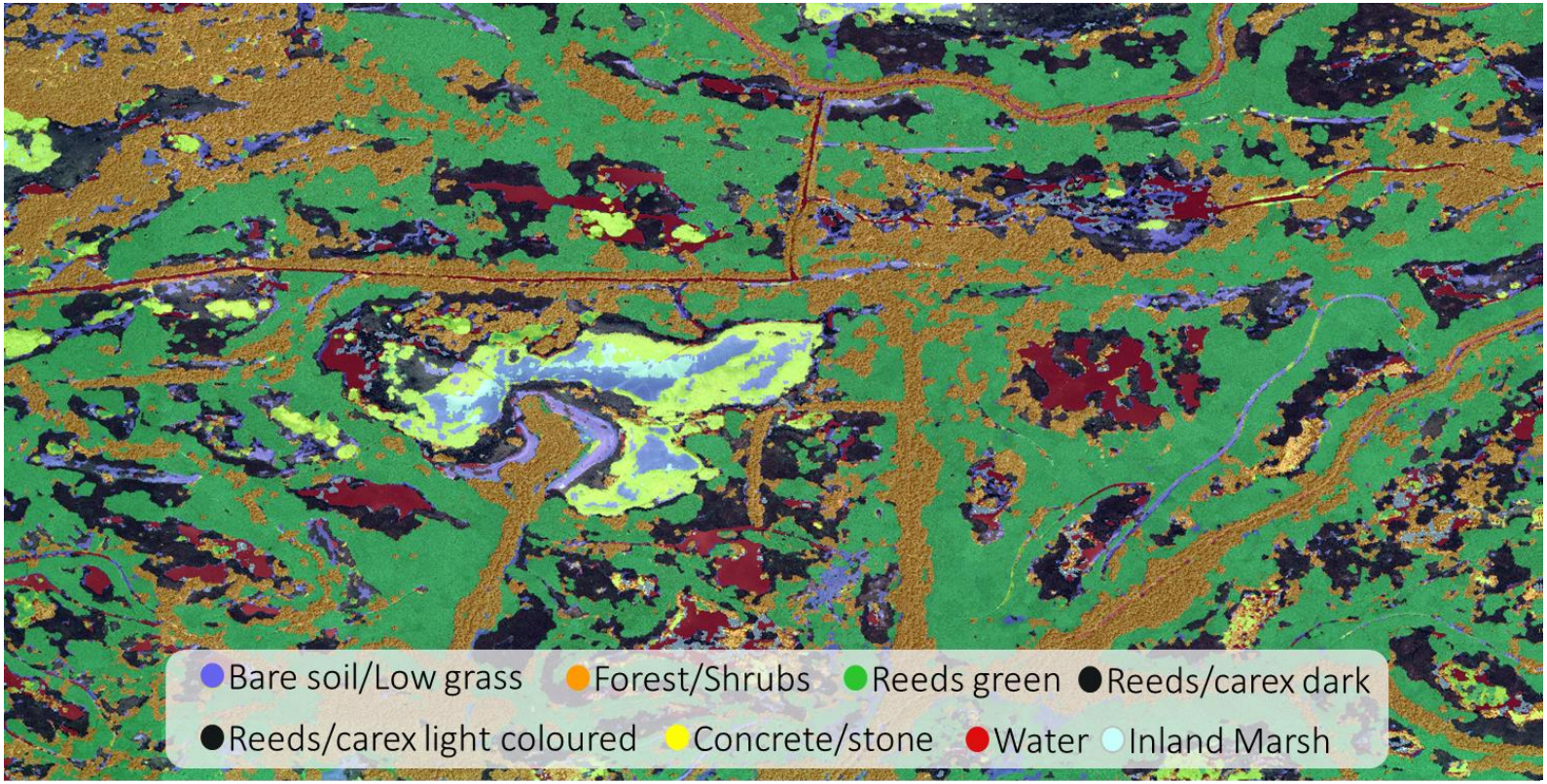
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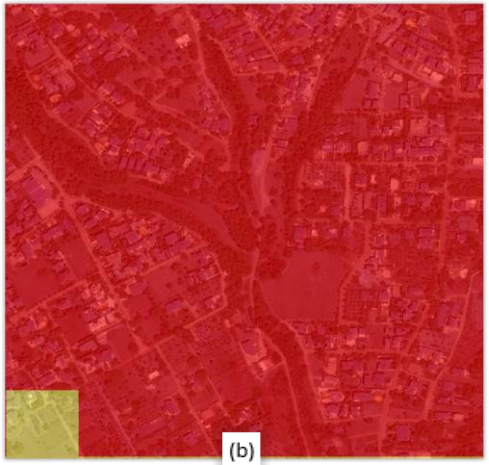
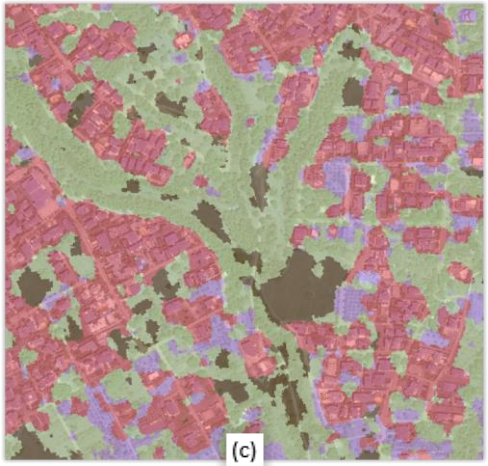
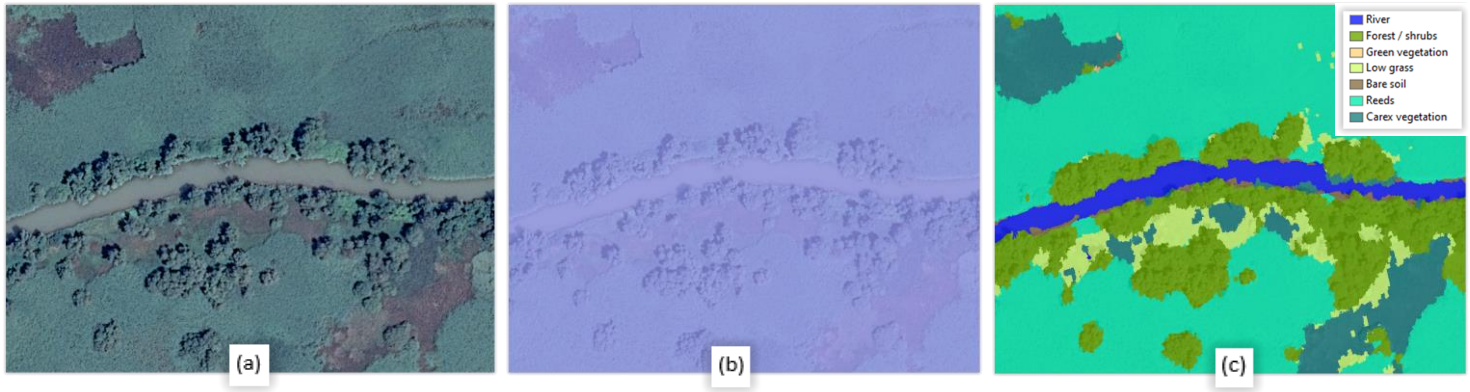
Analysis in conjunction with CORINE





SCENT classes	Area (km^2)	%	CORINE aggregated classes	Area (km^2)	%
Bare soil	17,62	12,17%	Bare areas (333)	1,8	1,24%
Cultivated areas (arable land, crops, pastures, heterogeneous agricultural areas)	11,32	7,82%	Cultivated areas (231,242,243)	17,54	12,11 %
Forest (including trees and herbaceous vegetation associations)	73,39	50,68%	Forest (311,312,313,323,324, 141,142)	57,78	39,90 %
Artificial areas (buildings, roads, paved areas, concrete)	42,49	29,34%	Artificial areas (111,112,121,122,124)	67,7	46,75 %

Analysis in conjunction with CORINE



SCENT Aggregated classes	Area (km²)	%	CORINE Aggregated classes	Area (km²)	%
Concrete / stone	0,23	0,09%	Artificial areas (112)	0,70	0,40%
River / water	18,24	7,40%	Inland water (511,512)	38,93	15,80%
Forest / shrubs	68,54	27,81%	Forest (311, 321, 324)	55,99	22,72%
Inland marsh (including reeds, green and carex vegetation)	129,15	52,41%	Inland marsh (411)	143,53	58,24%
Low grass & bare soil	30,26	12,28%	Pastures and arable land (211,231)	7,28	2,95%

THANK YOU!

Any Questions?

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