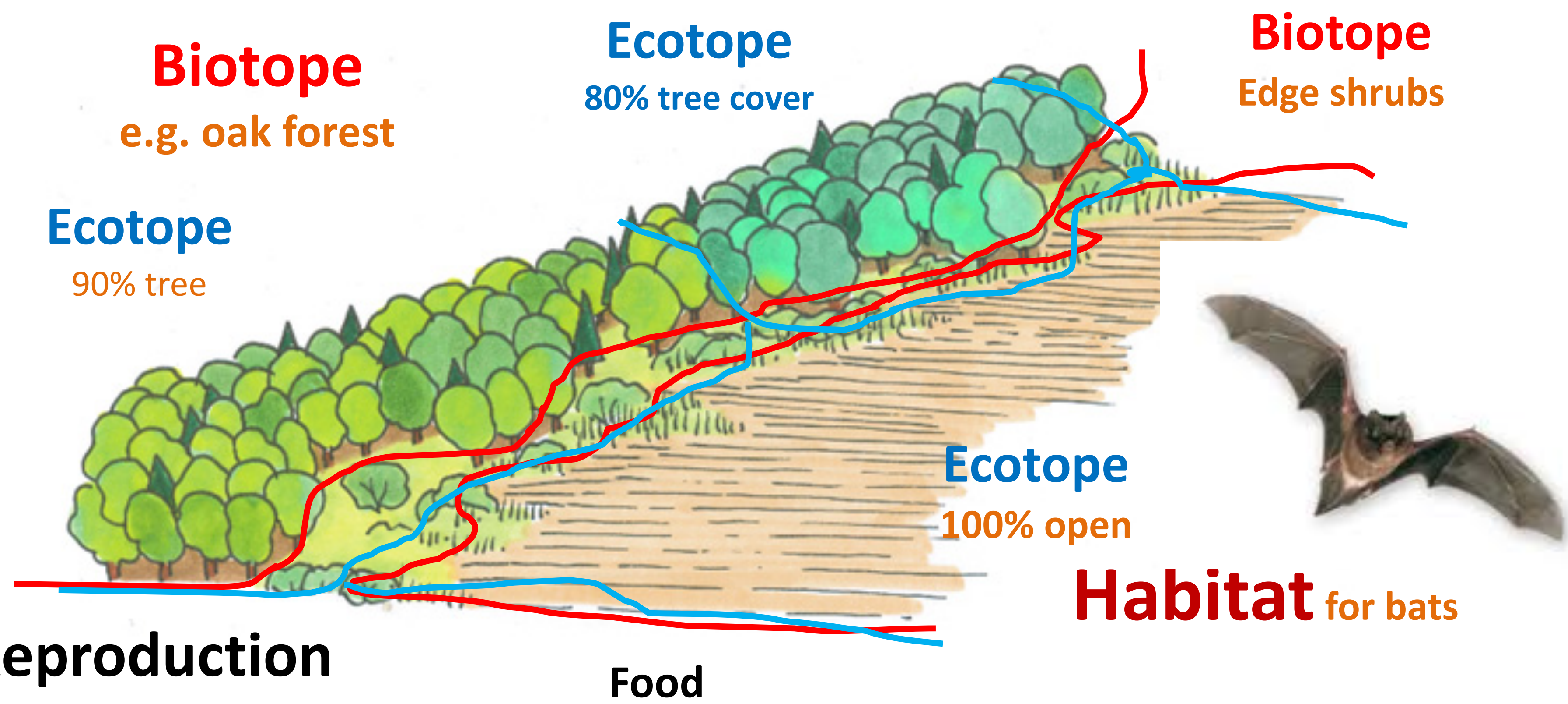
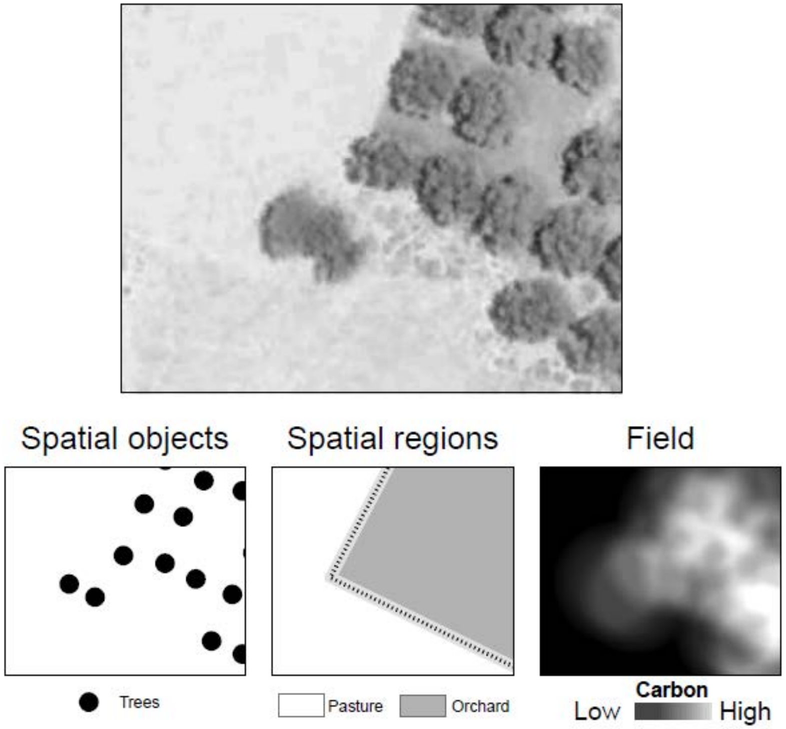
MAPPING WITH SPATIAL REGIONS FOR IMPROVED ECOSYSTEM MODELS

Julien Radoux, Axel Bourdouxhe, Thomas Coppée,
Marc Dufrêne, Pierre Defourny

Nature is complex



Models simplify



Spatial objects

- Categorical description
- Well defined boundaries

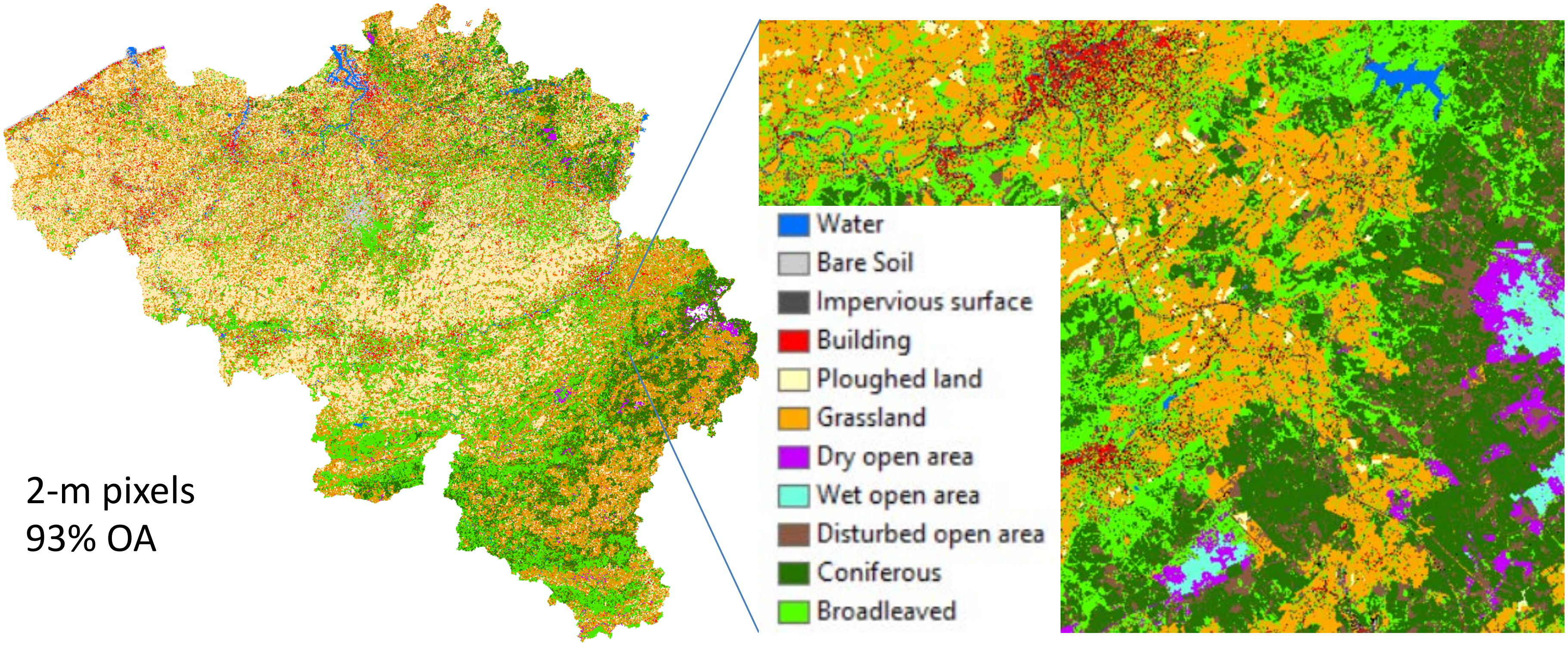
Spatial regions

- Arbitrary boundaries
- Quantitative description

Field

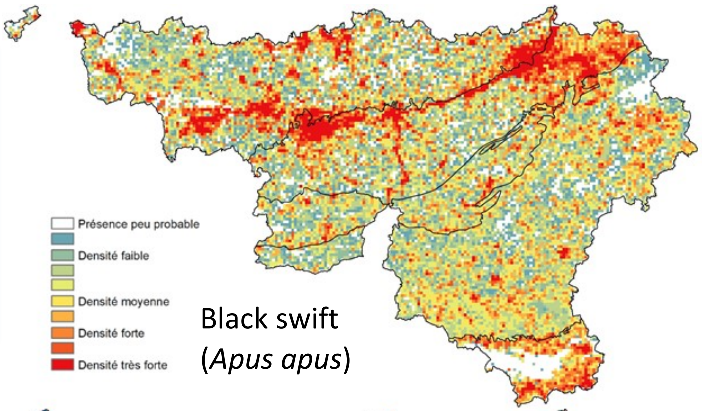
- No boundaries
- Quantitative variables

Land cover needs context

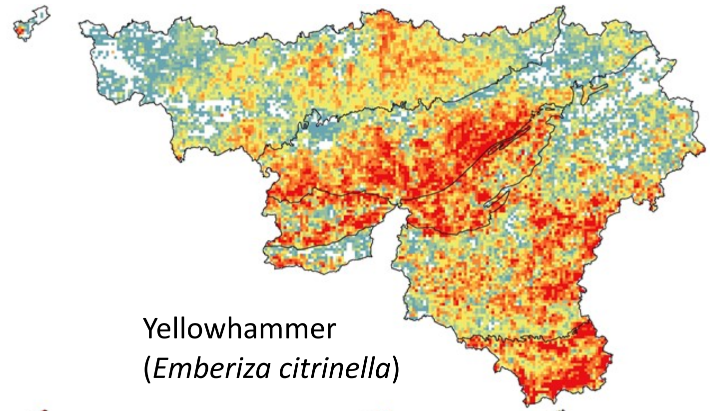


2-m pixels
93% OA

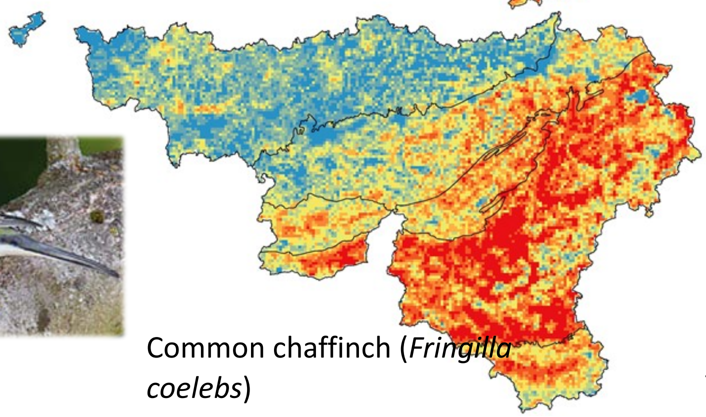
« Historical » use of grids for matching inventories



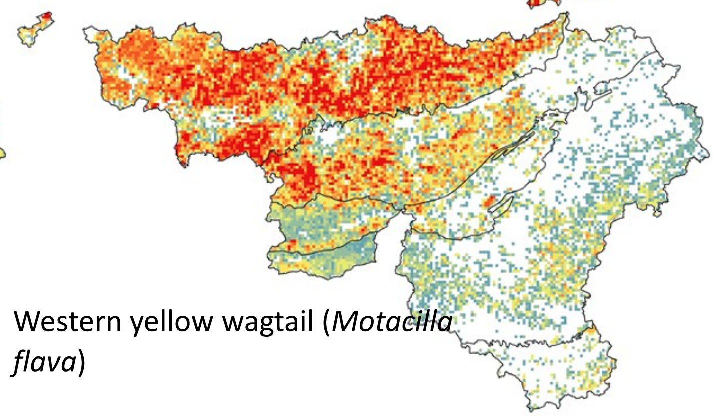
Black swift (*Apus apus*)



Yellowhammer (*Emberiza citrinella*)

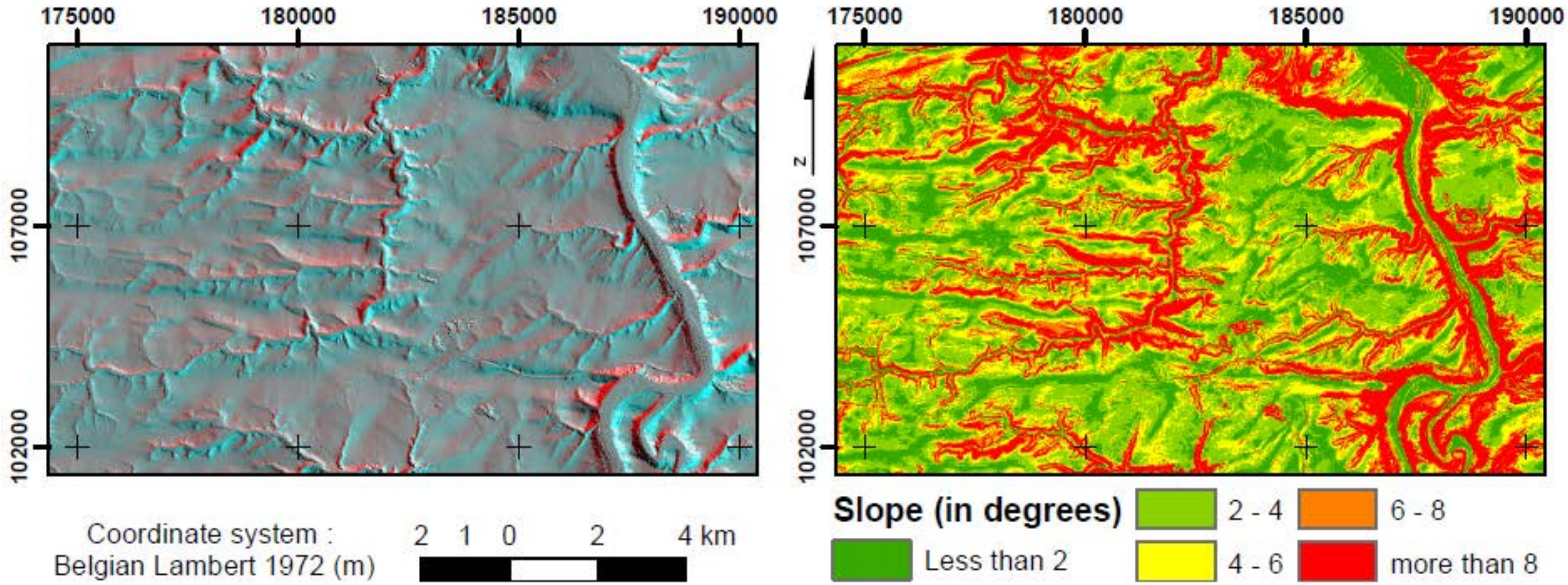


Common chaffinch (*Fringilla coelebs*)

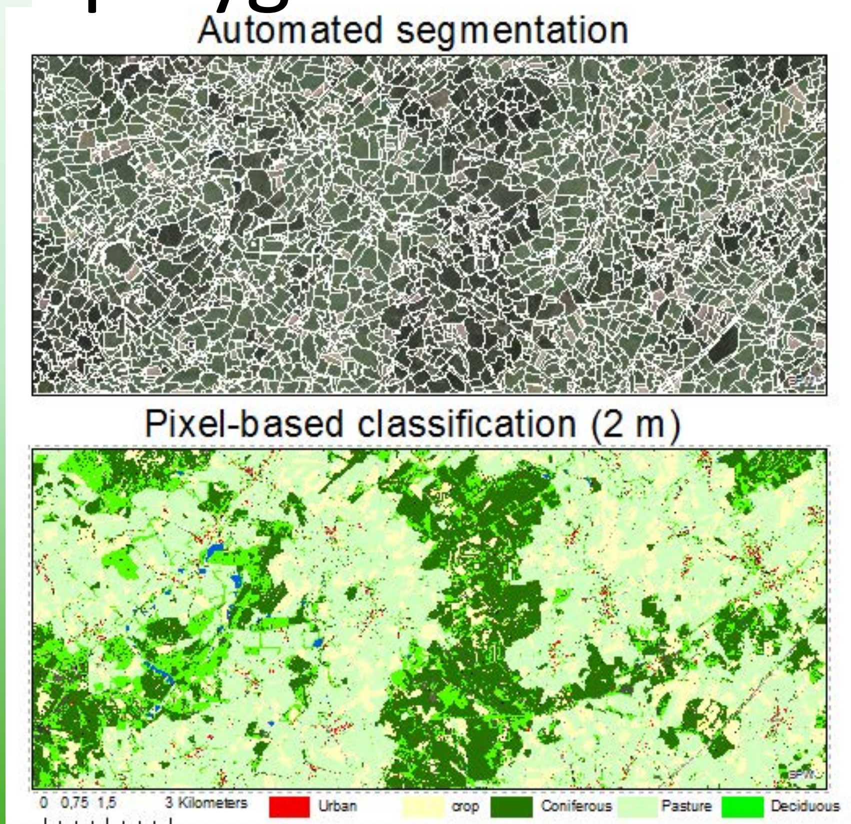


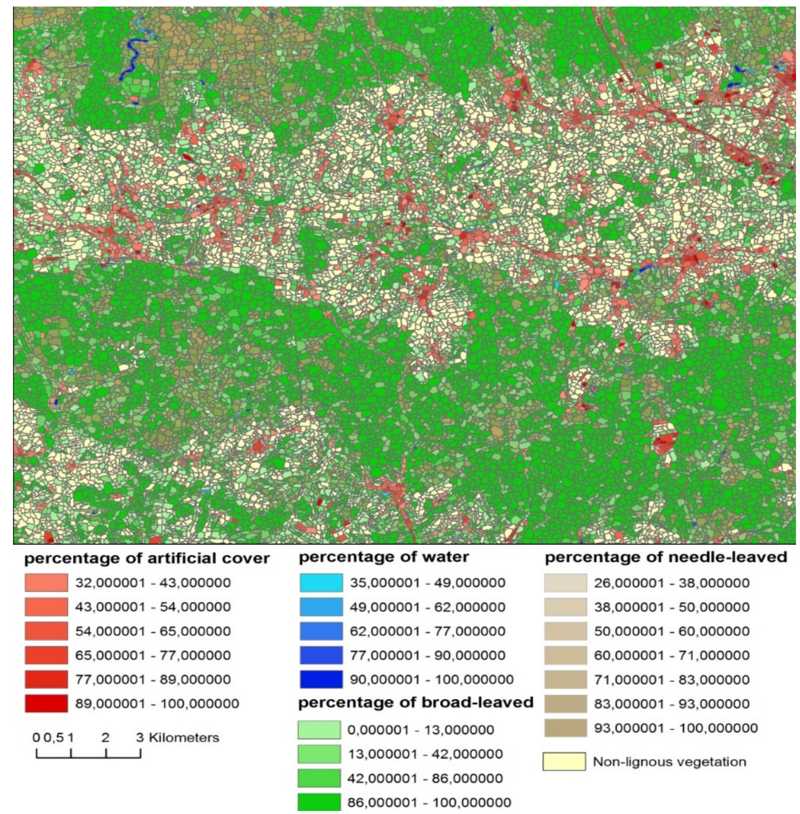
Western yellow wagtail (*Motacilla flava*)

Relief draws landscapes



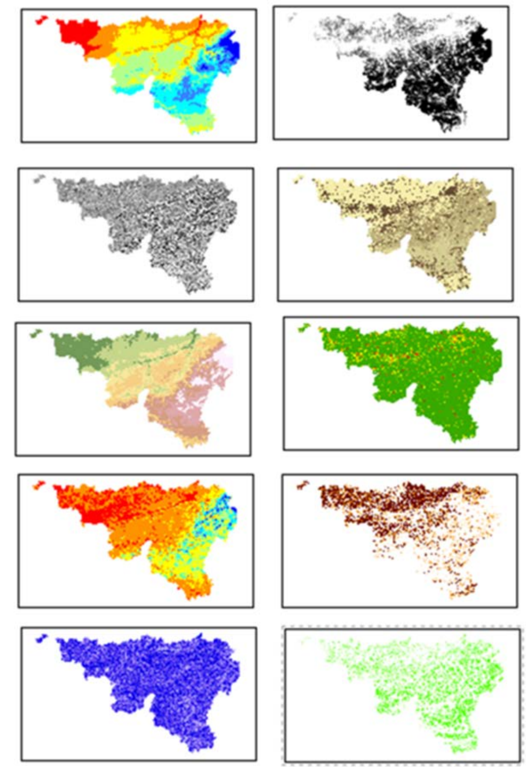
Land cover proportions inside landscape polygons





enriched with 100+ variables

From remote sensing	Others
Land cover proportions	Soil parameters
Height	Specific ecological value
Topography	Protected areas
Light pollution	Climate
Snow and vegetation phenology metrics	Distance to water, roads, settlements…



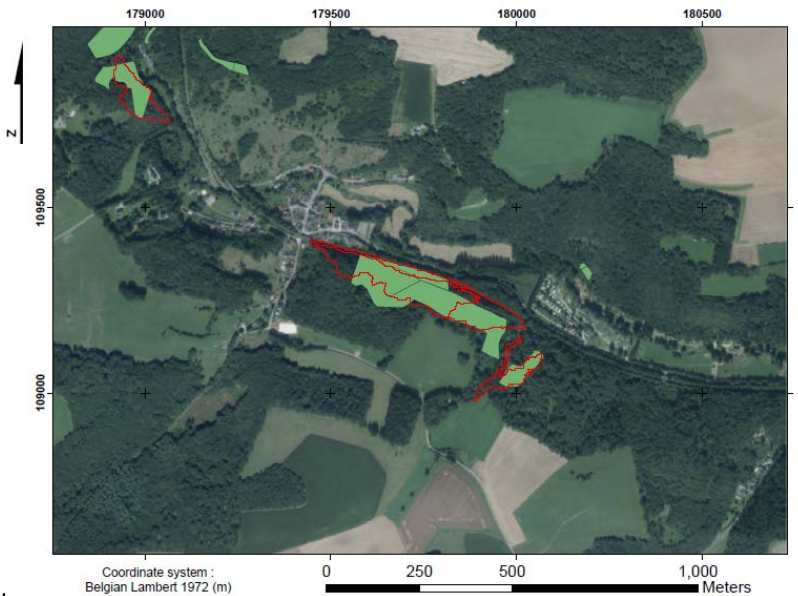
Good results on biotope models

Relative contribution of topography

	0	0.5	1	2
Matches	17	60	87	109
GAM OA_{Tot}	99.8	99.8	99.9	99.8
GAM OA	96.1	95.7	97.3	95.2
GAM AUC	81.4	95.6	97.6	95.2
GAM PA	77.2	93.1	97.0	92.7
GAM UA	15.0	21.9	37.2	22.5

(same ranking with Random Forest)

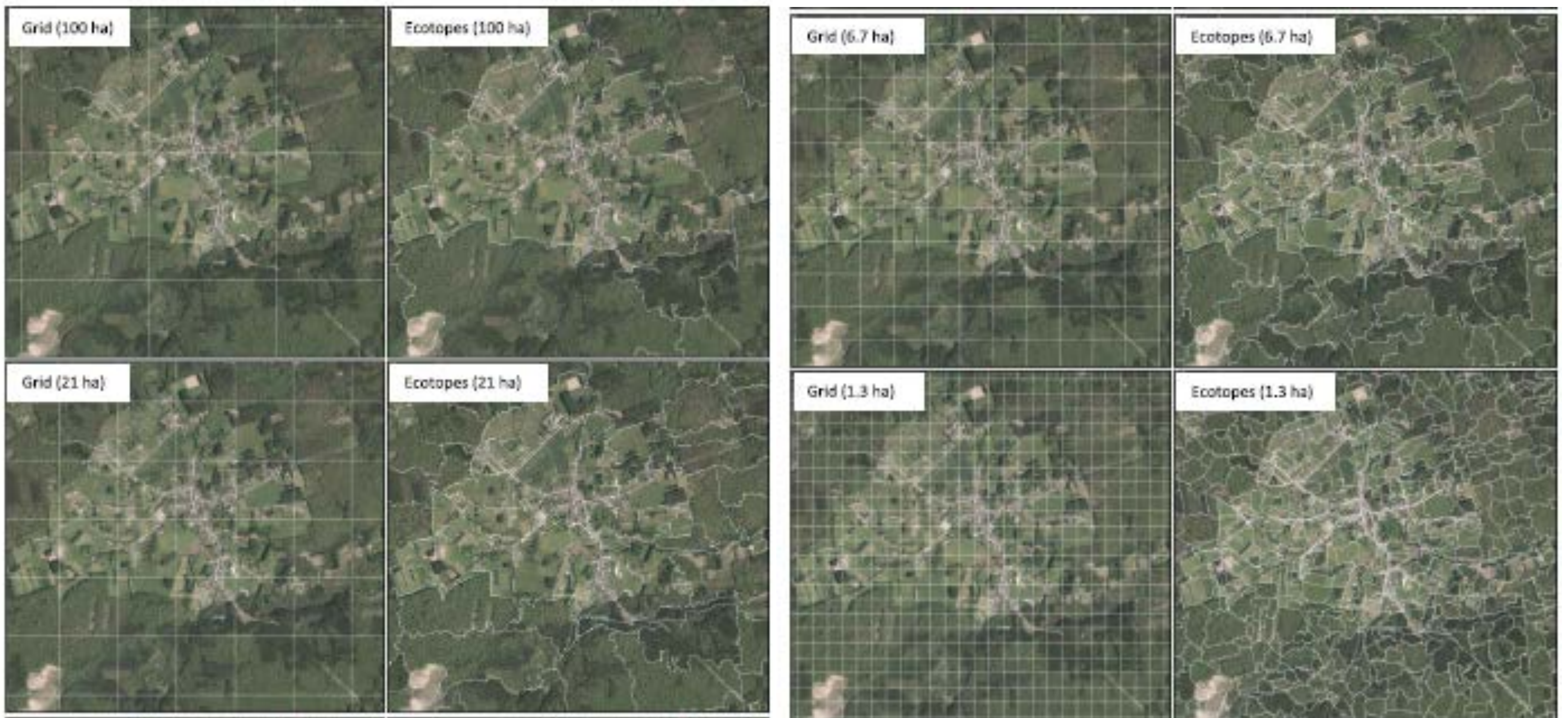
Accuracy indices taking area of spatial regions into account



Red: identified spatial regions
Green : field inventory

Radoux et al, 2019, Remote Sensing

Shape and size tested for habitats



Butterflies
- *A. iris*
- *B. aquilonaris*
- *B. eunomia*
- *B. selene*
- *E. aethiops*
- *L. helle*
- *N. quercus*

Birds
- *C. nigra*
- *C. cinclus*
- *C. canorus*

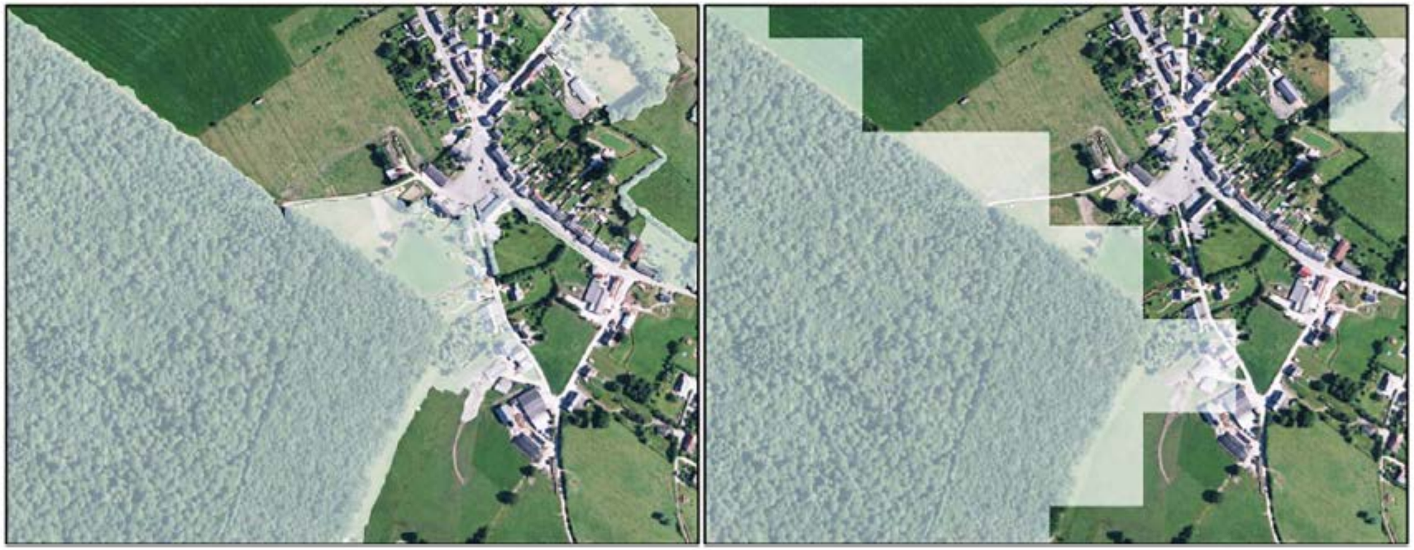
Amphibians
- *S. salamandra*

Reptiles
- *C. austriaca*

Mammals
- *M. meles*

Shape is important for conservation

Geographic objects	Regular grid



Irregular polygons better than regular grid for 8 out of 13 species

Delangre et al, 2017, Ecological Informatics

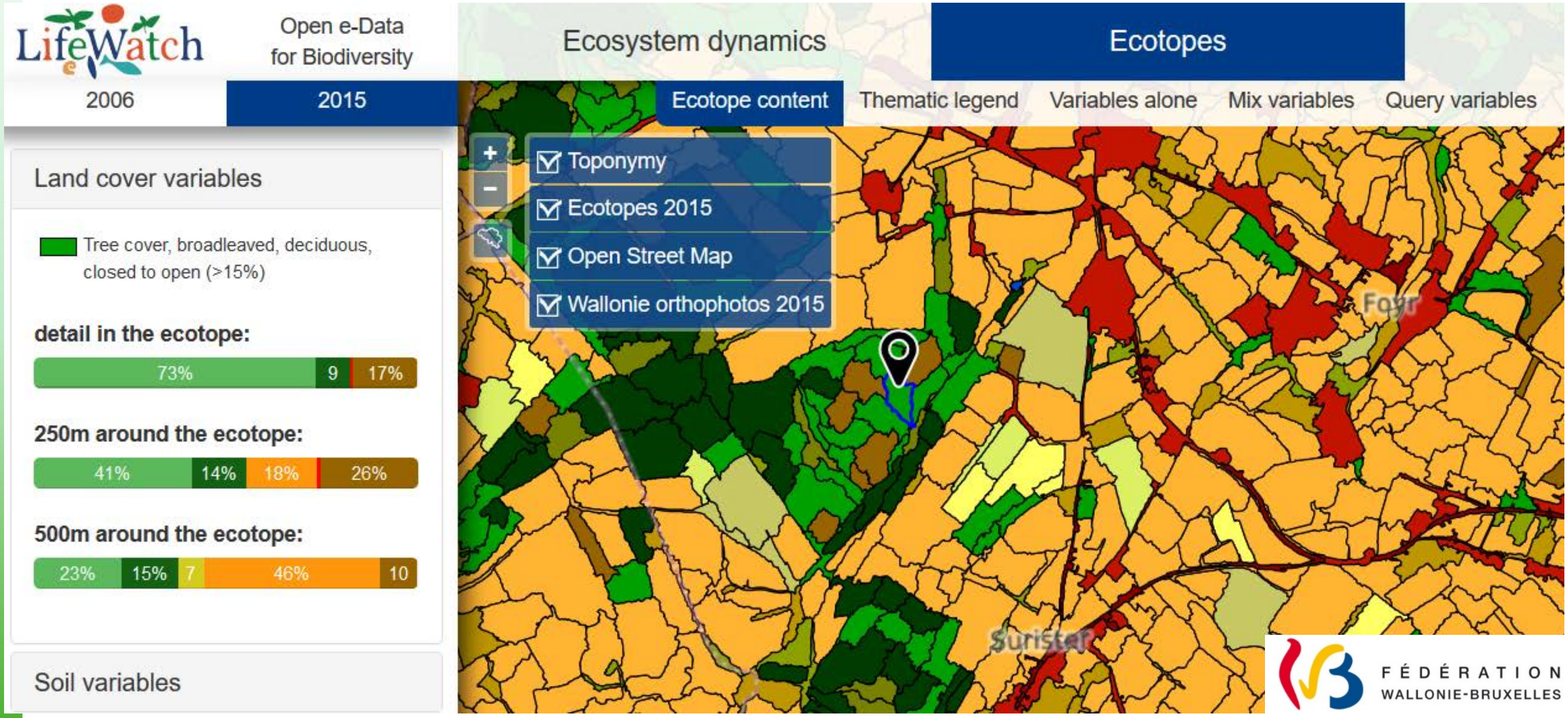
Conclusion

Spatial support is of paramount importanc

Topography positively contributes to spatial region homogeneity

Quantitative parameters facilitate model making

uclouvain.be/lifewatch to test « for real »



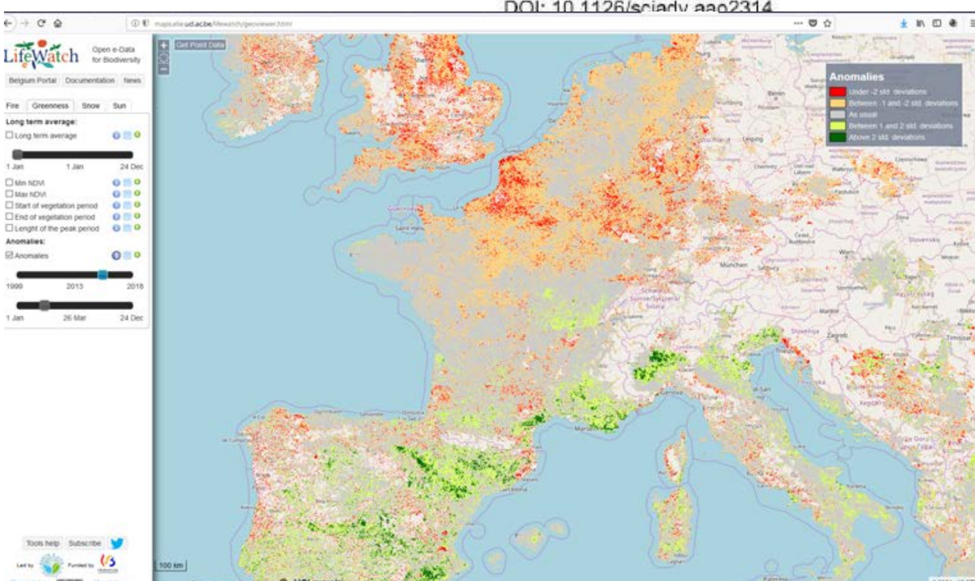
Also supporting data distribution and ecosystem dynamics

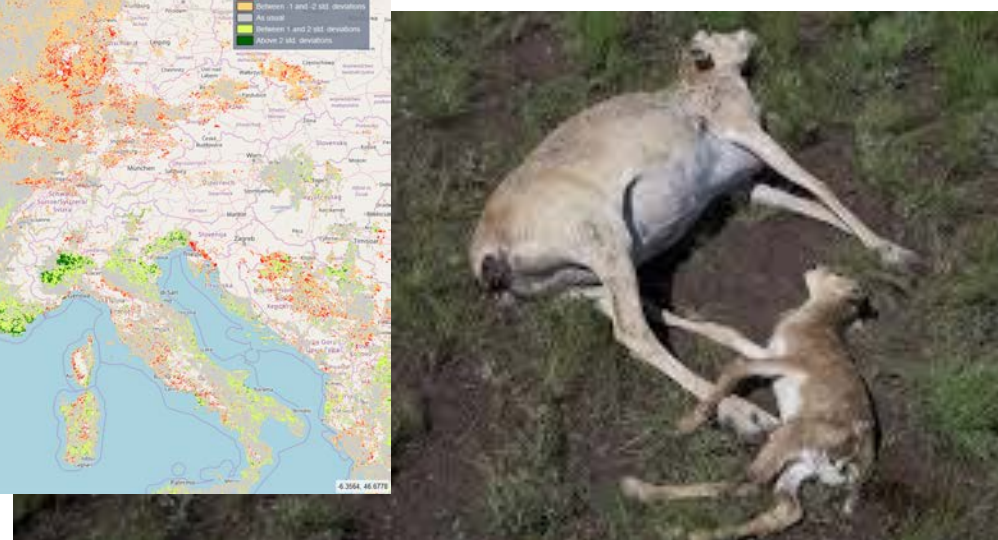
ScienceAdvances

Saigas on the brink: Multidisciplinary analysis of the factors influencing mass mortality events

Richard A. Kock, Mukhit Orynbayev, Sarah Robinson, Steffen Zuther, Navinder J. Singh, Wendy Beauvais, Eric R. Morgan, Aslan Kerimbayev, Sergei Khomenko, Henny M. Martineau, Rashida Rystaeva, Zamira Omarova, Sara Wolfs, Florent Hawotte, Julien Radoux and Eleanor J. Milner-Gulland

Sci Adv **4** (1), eaao2314.
DOI: 10.1126/sciadv.aao2314





EARTH & LIFE INSTITUTE