

Contribution of remote sensing and GIS to the research infrastructure for biodiversity research

ELI-day, May the 19th 2022

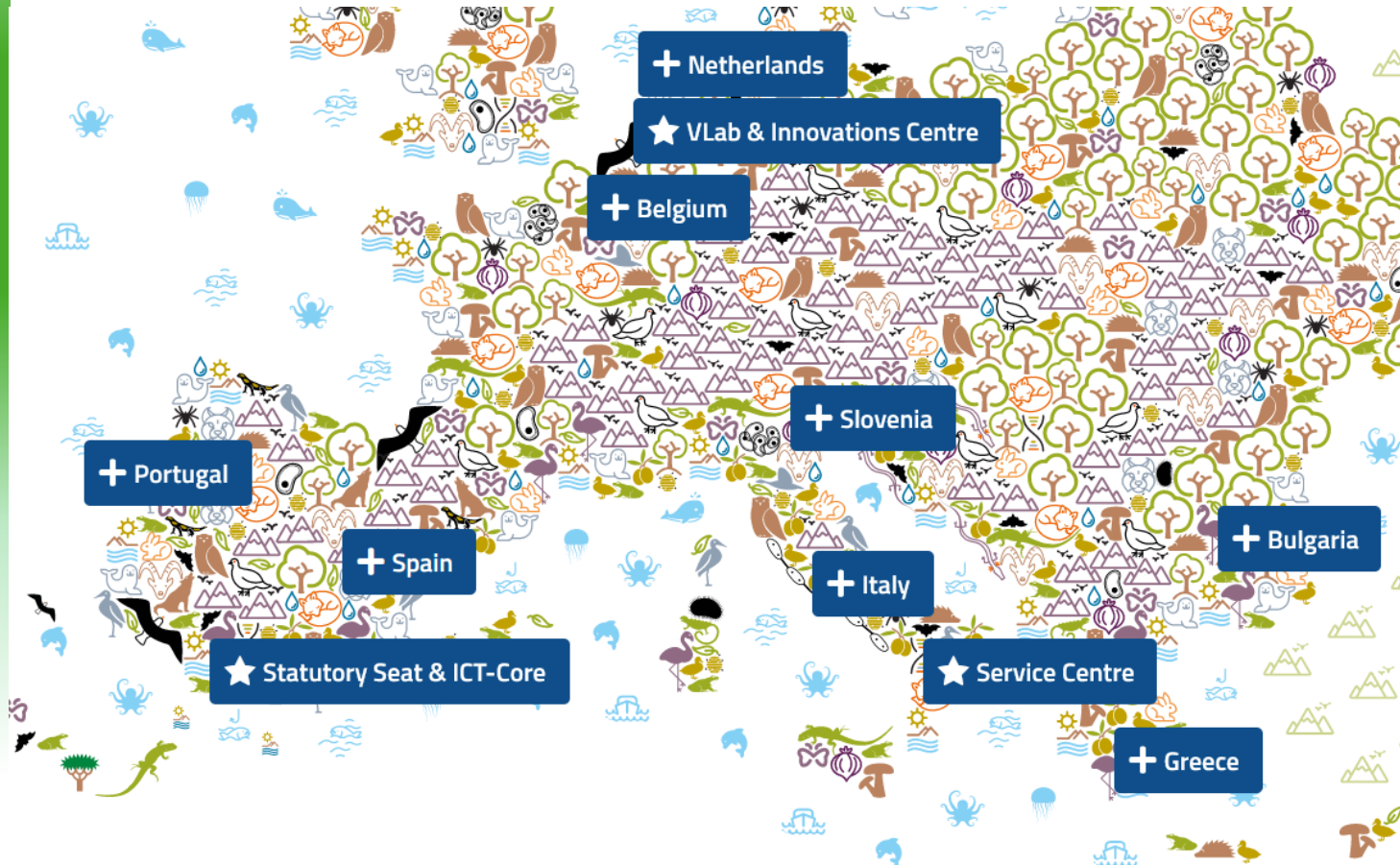
J. Radoux, M. De Vroey, T. De Maet, B. Goffart and P. Defourny

(in Partnership with A. Bourdouxhe, T. Coppée and M. Dufrêne from ULiège)

Avec le support de la Fédération Wallonie Bruxelles

Contribution of FWB to Lifewatch-ERIC

- Services towards systemic understanding of ecosystems
- Bottom up approach to provide all the ingredients of the cake



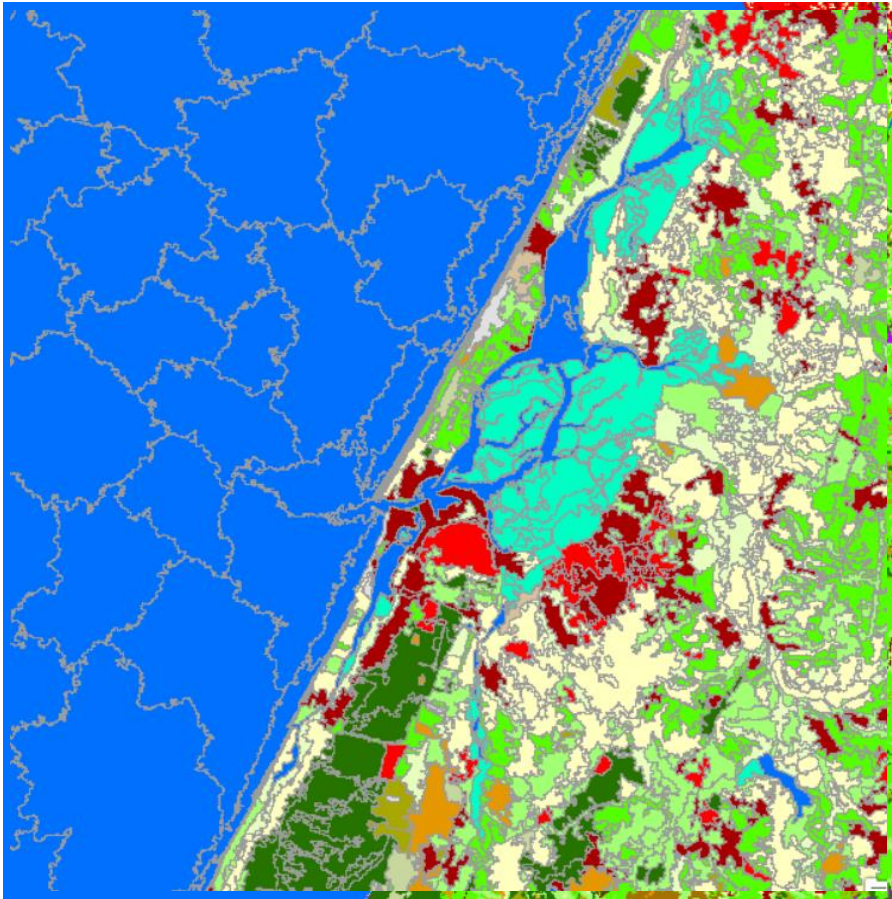
FWB's focus :
geodata

Collaboration in the era of openness

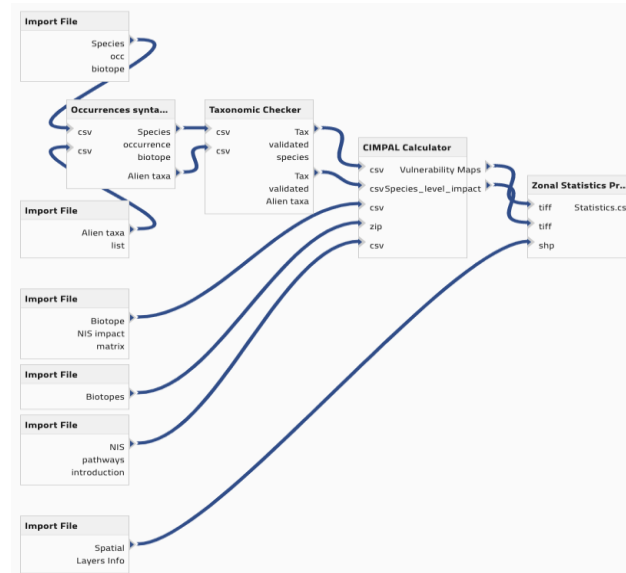
Processing chain

- Work together with TrIAS to develop IAS incidence and impact assessment tool
 - Shared tools, data and expertise
 - Operational workflow on Lifewatch-ICT core
- Get data from GBIF (TrIAS)
- Build datacube (TrIAS + Lifewatch)
- Compute incidence map (Lifewatch)
- Compute impact map (Lifewatch)

Sustaining existing spatial analysis workflows on ICT-Core

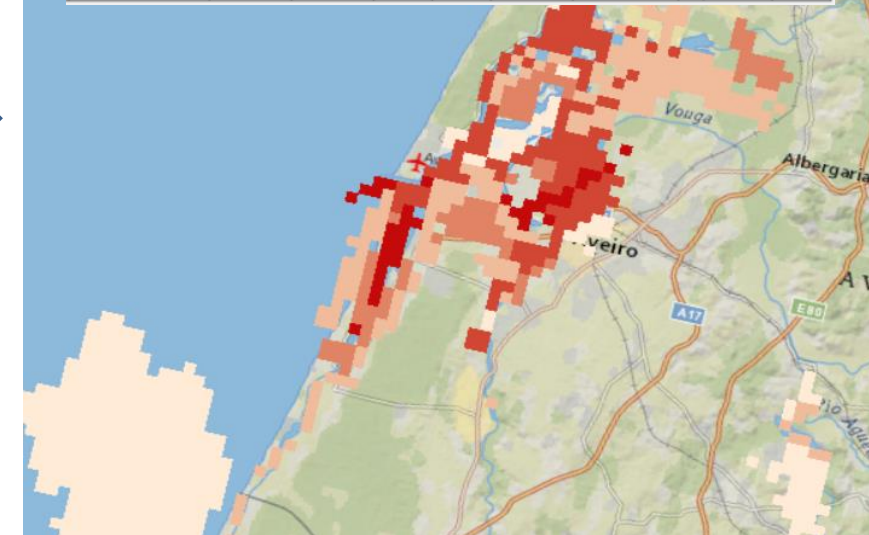


Ecopatches + species occurrences



NIS list + impact matrix

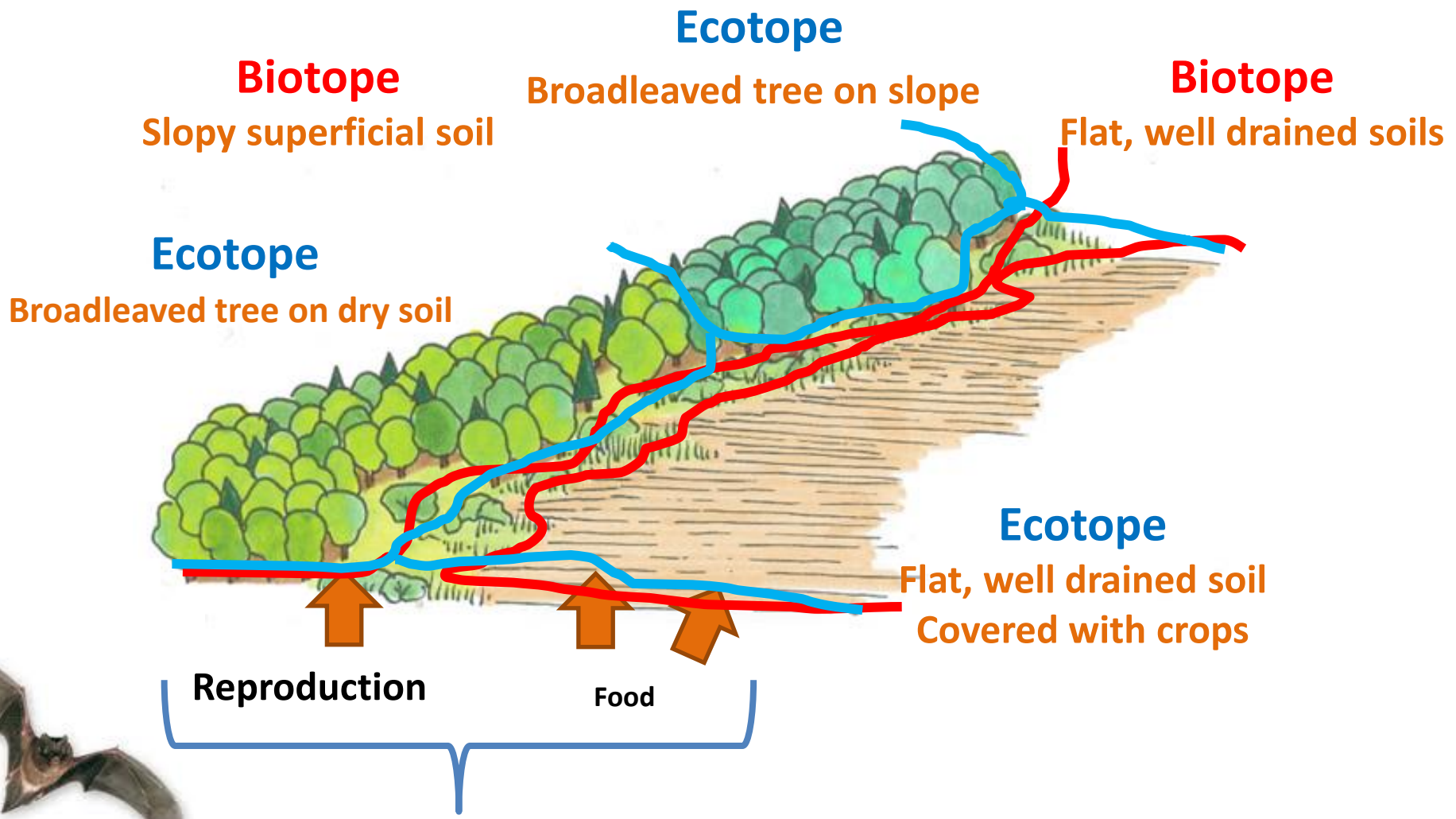
id habitat	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM
0	9	2250000	2	16	14	11,555556	5,397759	104
1	2	500000	2	2	0	2	0	4
2	5	1250000	2	2	0	2	0	10
3	1	250000	14	14	0	14	0	14
4	3	750000	1	16	15	8,333333	6,128259	25
5	6	1500000	2	16	14	9,166667	5,785518	55
7	14	3500000	2	38	36	17,142857	9,876792	240
8	5	1250000	2	6	4	3,2	1,6	16
9	4	1000000	2	18	16	9	6,403124	36
10	25	6250000	1	49	48	12,72	10,93808	318
11	1	250000	12	12	0	12	0	12
13	3	750000	6	20	14	14	5,887841	42



Sum of NIS impacts per patch

Building and curating open data

Different partitions of landscape in ecology

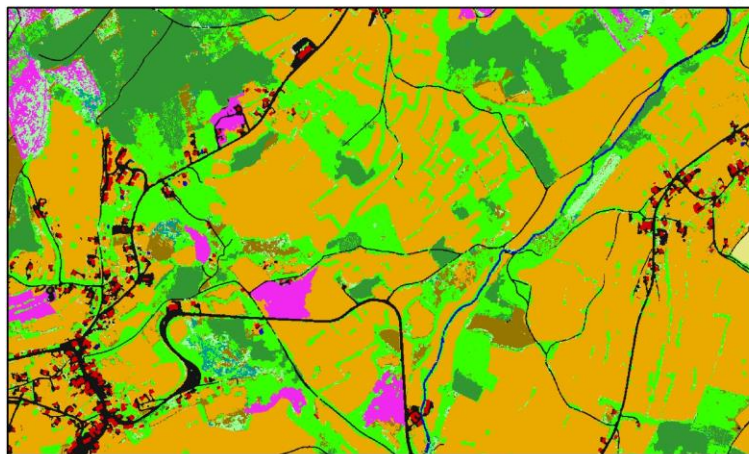


Ecotopes: integrating land cover and biotopes variables

Automated image segmentation (topography and orthophotos)



Pixel-based land cover classification (2 m)



Ecotopes (here with LCCS labels)



0 0,25 0,5 1 1,5 Kilometers

■ Built up
 ■ Grassland
 ■ Needleleaved
 ■ Broadleaved
 ■ Water

Each polygon is described with quantitative land cover information

Open e-Data for Biodiversity
LC biodiversity variables
Ecotopes
Habitat Model
Antarctica

Choose a legend :

LCCS v

Land cover variables

Tree cover, broadleaved, closed to open (>50)

detail in the ecotope:

80%

250m around the ecotope:

69%

500m around the ecotope:

59%

1km around the ecotope:

43%

Soil variables

Topographic variables

Ecotope content
Thematic legend
Individual variables
Variable Combinations
Query variables
Download

Toponymy

Ecotopes

Land cover

Open Street Map

Orthophotos

Led by Earth & Life Institute

Funded by Fédération Wallonie-Bruxelles

lifewatch.be lifewatch.eu

© OpenStreetMap contributors.

Ecotope description integrates 100+ variables

TOPOGRAPHY

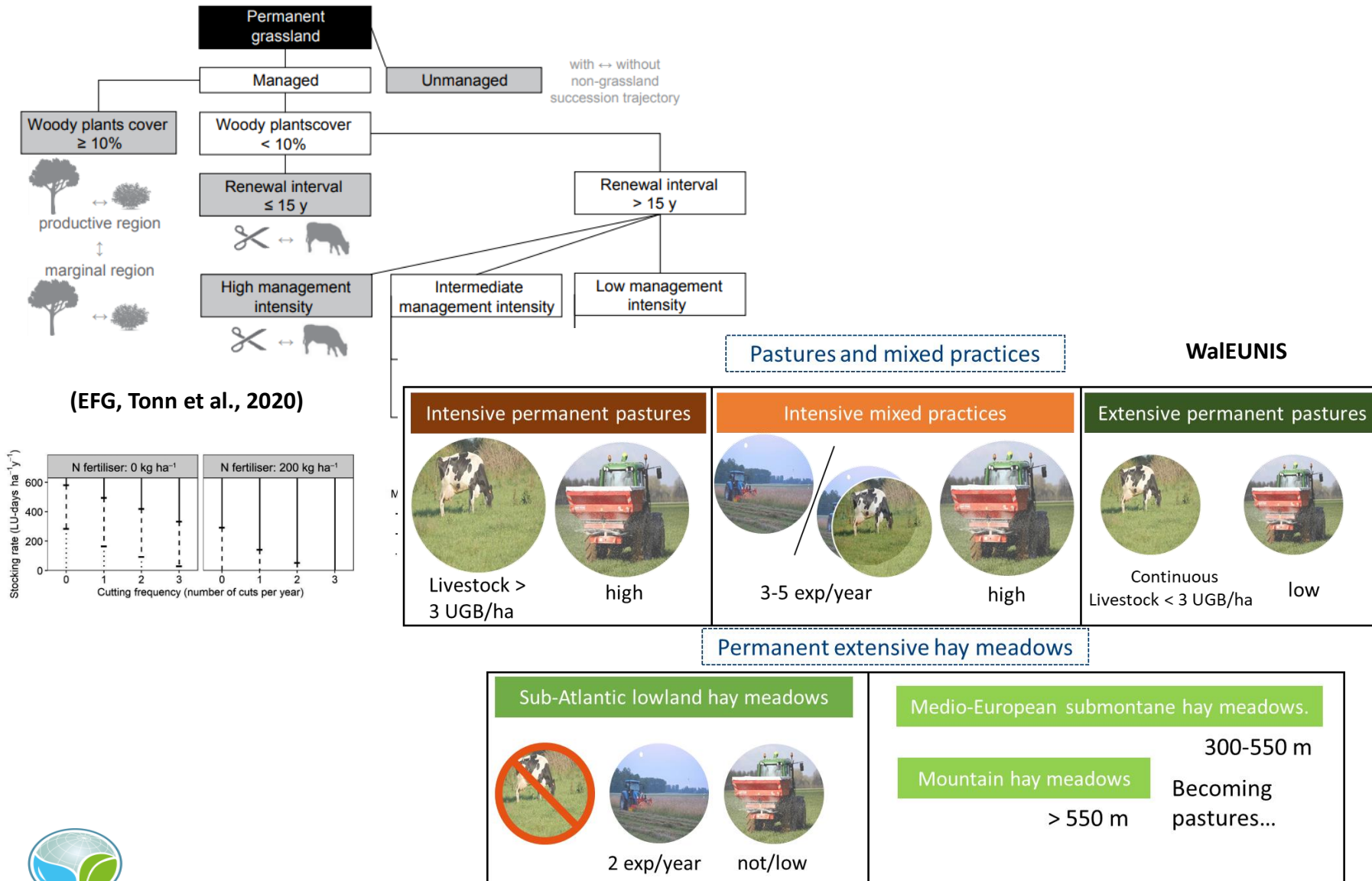
CONTEXT

LAND COVER

SOILS

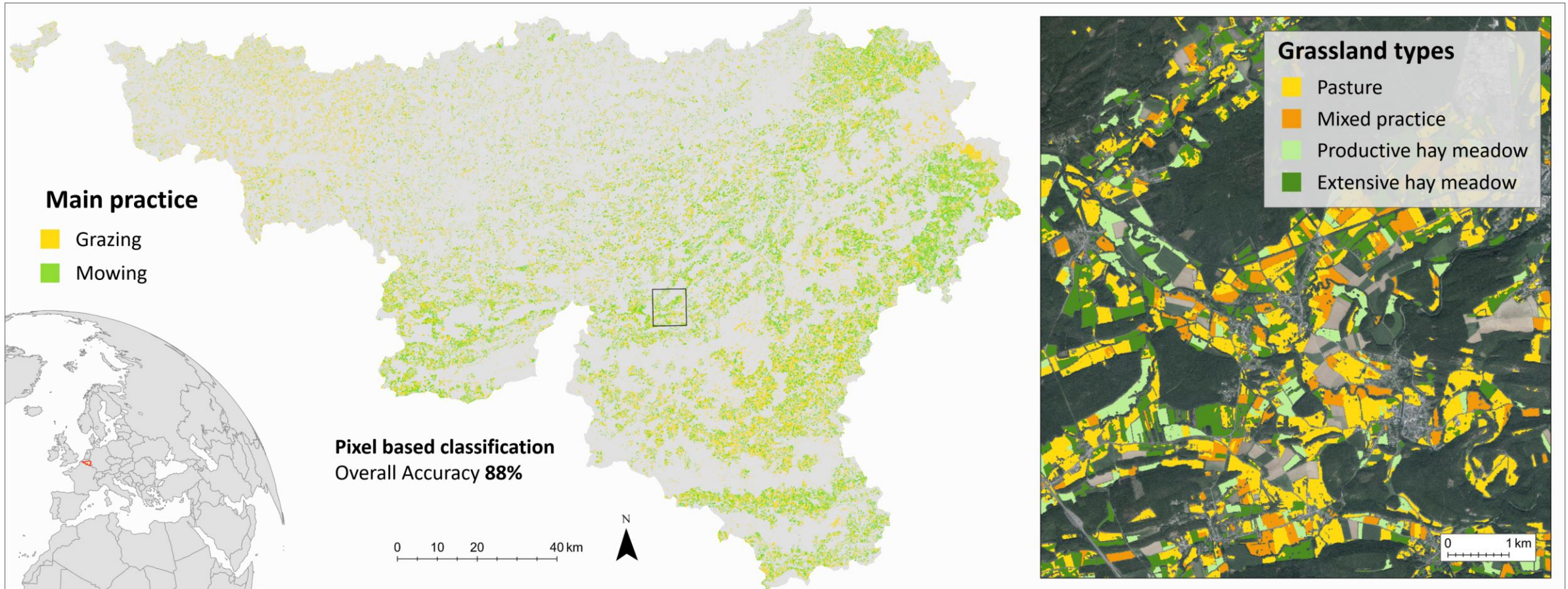
CLIMATE

More than land cover thanks to Grassland Use Intensity



Mowing and grazing detection with « Sentinels »

Sentinel-1 (SAR) coherence data fill the gap of Sentinel-2 (optical) data



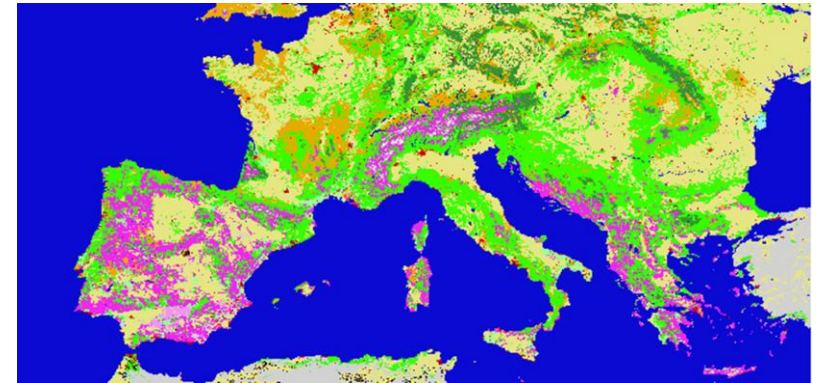
Now applying the ecotope concept in Europe

- Success with ecotope-based model in Belgium

(Delangre et al 2018, Bourdouxhe et al 2020, Radoux et al 2019)

- Less precise data in Europe

- Work at 10 m resolution
- Less explanatory variables



- Plenty of data sources, but what do we take ?

- Global products are not optimized for Europe
- Copernicus high resolution layers are not complete
- ➔ Data fusion to take the best out of each dataset

Ecopatches available for South of Europe

Choose a legend :

Ecosystem majority ▾

Land cover variables

- Mesic grasslands

Topographic variables

Other

- Artificial night light: 0.1 %
- Distance to settlements: 43.5714 m
- Distance to roads: 6.21901 m

Land cover variables

Mosaic natural vegetation (Tree, shrub, herbaceous cover) (>50%) / cropland (<50%)

detail in the ecopatch:



Services to visualize and extract data

- Bring your own csv file
- Select your variables
- Analyse the data on your computer
- Our tip: look at the data first

The screenshot shows the LifeWatch web application interface. At the top, there are tabs for "LC biodiversity variables", "Ecotopes", and "Habitat Model". The "Ecotopes" tab is active. Below the tabs, there are buttons for "2006", "2015", "2018", and "2019". The main content area is divided into two columns: "Locations" and "Variables".

Locations

- From map: A map showing a region in Europe with several location markers. An "Add" button is visible on the map.
- From file
- From coordinates

Variables

- Topography
- Land cover
- Land cover context at 250 m
- Land cover context at 500 m
- Land cover context at 1 km
- Soil depth
- Temperature
- Precipitation
- Snow dynamics
- Marginal soil proportions
- Soil drainage
- Height

List of 12 points

Delete	Longitude	Latitude
X	5.32910	50.17971
X	5.72461	50.34826
X	5.61475	50.32021
X	5.54883	50.15156
X	5.54883	50.09521
X	5.54883	50.09521
X	5.30713	50.02468
X	5.46094	49.91162
X	5.83447	50.26406

Additional text on the page includes "Ecotope database v4.16 :", "Thematic legend (.qml)", "Thematic legend (.lyr)", "Extract attributes at points", "Ecotope documentation is available here", "The landscape has been divided into ecotopes based on automated delineation taking remote sensing data and topography as input variables. More details are available in this paper .", "The v2.7 dataset has been validated. The results have been published in 'Good practices for Object-based Accuracy assessment' (2017) , which also documents the thematic legend.", and "The land cover proportions inside ecotopes are based on a 2-m pixel based".


At the bottom, there are logos for "biodiversité paysage", "EARTH & LIFE INSTITUTE", and "FÉDÉRATION WORLDWIDE PROJECTS". The website addresses "lifewatch.be" and "lifewatch.eu" are also visible.

Much more on uclouvain.be/lifewatch

LifeWatch Open e-Data for Biodiversity

2006 2015 Evolution

Choisir une espèce
Bruant jaune



Par © Rene Dumoulin

Le Bruant jaune est bien repandu dans les zones agricoles wallonnes. Il est facile à repérer durant la période de chant et les modèles semblent bien représenter la réalité. Une rétraction d'aire combinée à une diminution des densités dans les zones les plus densément peuplées sont le signe typique d'une diminution rapide de

Télécharger les données oiseaux ici

Mené par

Variables dynamiques des écosystèmes

Ecotopes **Modèle d'habitat** Antarctique

Oiseaux **Végétation** Télécharger

Bruant jaune

4.0776, 51.0775

- 11.40 /km²
- 8.64 /km²
- 6.89 /km²
- 5.68 /km²
- 4.74 /km²
- 3.94 /km²
- 3.18 /km²
- 2.46 /km²
- 1.74 /km²
- 1.03 /km²
- 0.40 /km²
- 0 /km²

Catégorie de végétation naturelle potentielle

Niveau de confiance: 0%

Probabilité de végétation naturelle potentielle

- Boulaies tourbeuses
- Aulnaies marécageuses
- Chênales-boulaies à Molinie
- Forêts alluviales
- Chênales-frênales Neutrophiles Climaciques
- Climaciques
- Chênales-charmales Famennienne
- Climaciques
- Chênales-charmales Acidiclines Climaciques
- Hêtraies Neutrophiles
- Forêts de ravin hygrosclaphiles

Mené par

Variables dynamiques des écosystèmes

Ecotopes **Modèle d'habitat** Antarctique

Oiseaux **Végétation** Télécharger

Végétation Naturelle Potentielle

- Boulaies tourbeuses
- Aulnaies marécageuses
- Chênales-boulaies à Molinie
- Forêts alluviales
- Chênales-frênales Neutrophiles Climaciques
- Chênales-charmales Famennienne
- Chênales-charmales Acidiclines Climaciques
- Hêtraies Neutrophiles
- Forêts de ravin hygrosclaphiles
- Hêtraie acidiphile
- Hêtraies et chênales calcicoles
- Chênales acidiphiles thermophiles
- Chênales-charmales xérophiles famenniennes

Mené par

LifeWatch Open e-Data for Biodiversity

Nitrate

Silicate

Oxygène

Température

Salinité

Contexte

Autres

Mené par

Variables dynamiques des écosystèmes

Ecotopes **Modèle d'habitat** **Antarctique**

Variables Mixage RGB Télécharger

-128.4102, -4.3298

Nitrate en surface, été

36.51 µmol/kg

0 µmol/kg

Moyenne long terme:

Probabilité de neige

1 Jan 1 Jan 27 Dec

Début de la période d'enneigement

Fin de la période d'enneigement

Durée moyenne de la période d'enneigement

Anomalies:

Anomalies

2001 2001 2021

1 Jan 1 Jan 27 Dec

Mené par

Variables dynamiques des écosystèmes

Ecotopes **Modèle d'habitat** **Antarctique**

Végétation verte Neige Incendie Soleil Télécharger

Probabilité de neige

pourcentage surfacique par cellule

- Moins de 0.1 (Peu probable)
- Entre 0.1 et 0.25
- Entre 0.25 et 0.5
- Entre 0.5 et 0.75
- Entre 0.75 et 0.9
- Plus de 0.9 (Très probable)

Mené par