Comparison of methods to model species habitat networks for decision-making in nature conservation: The case of the wildcat in southern Belgium

Ecological networks for nature conservation

To maintain species population in highly fragmented landscape,we need to :

➢ Increase species habitat ➡ Biodiversity core areas

+ **=** Ecological network

➢ Improve landscape connectivity ➡ Ecological corridors

Ecological networks for nature conservation

Biodiversity core areas

Identify species habitat and presence:

➤ Different uses of available data (Species distribution models, Biodiversity indices, Areas under conservation status)

➤ Dependent of local particularities

Ecological corridors

Predict species movements in the landscape:

➤ Far more challenging

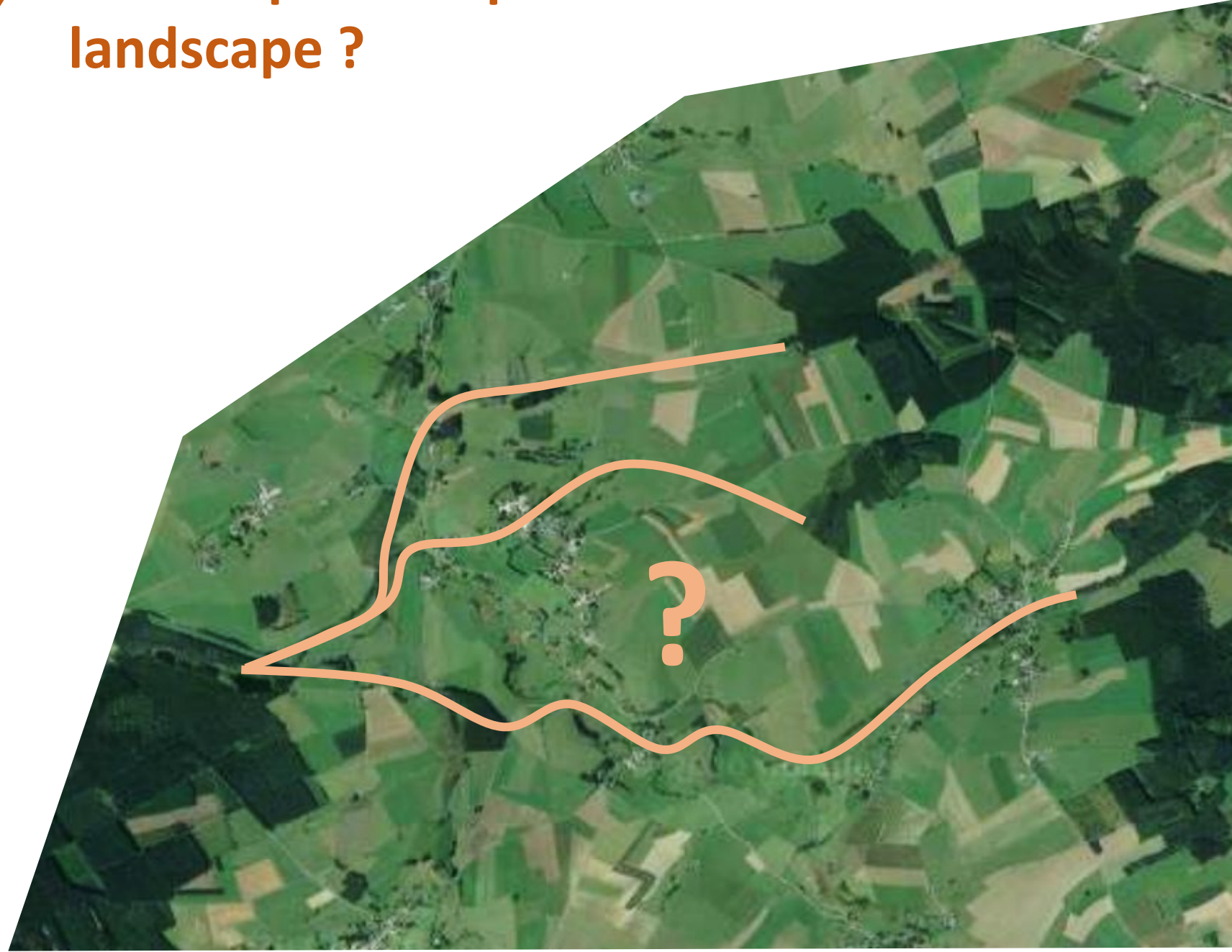➤ Different method exists and are presented as divergent

How to predict species movements in the landscape ?

Least cost path modelling

➤ Habitat map

+

➤ Restistance to movement maps

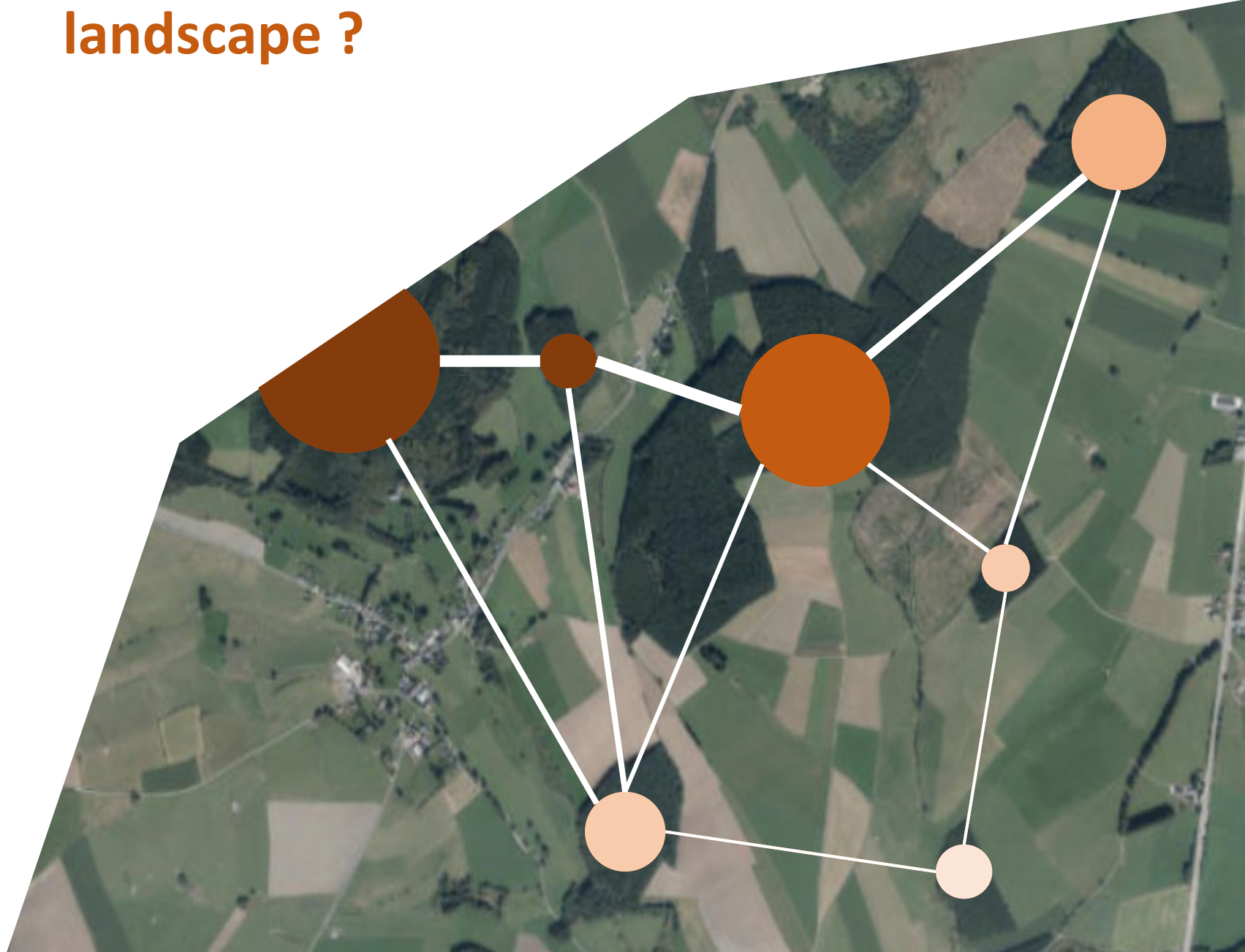➤ Least cost path = path with least cumulated movement cost

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How to predict species movements in the landscape ?

Applying spatial graph theory

➢ Shematizing networks as nodes and link allows to apply network properties

➢ We can therefore order important element of the network for the connectivity

How to predict species movements in the landscape ?

Expertise vs. occurrence data

➢ Expertise: more subjective and can be far from reality

➢ Occurrence data: species distribution models doesn't reflect preference for movements and need of good occurrence data

Research questions

1. Do both methods identify the same elements of the ecological network?
2. Would a mixed method reduce the shortcomings of the other two approaches?

➤ The wildcat is an emblematic forest species with high dispersal distance (10km)

➤ Walloon forests are an important crossroads for the connectivity of European forests

Comparing three methods from network construction to priority action maps

Knowledge-driven

1. Habitat map based on literature
2. Resistance map based on literature

Data-driven

1. Habitat map based on species distribution models (SDM)
2. Resistance map based on inverted SDM

Mixed

1. Habitat map based on SDM
2. Resistance map based on literature

3. Habitat network map

4. Habitat network priority

5. Priority action maps

Ecotopes Database by: LifeWatch FWB

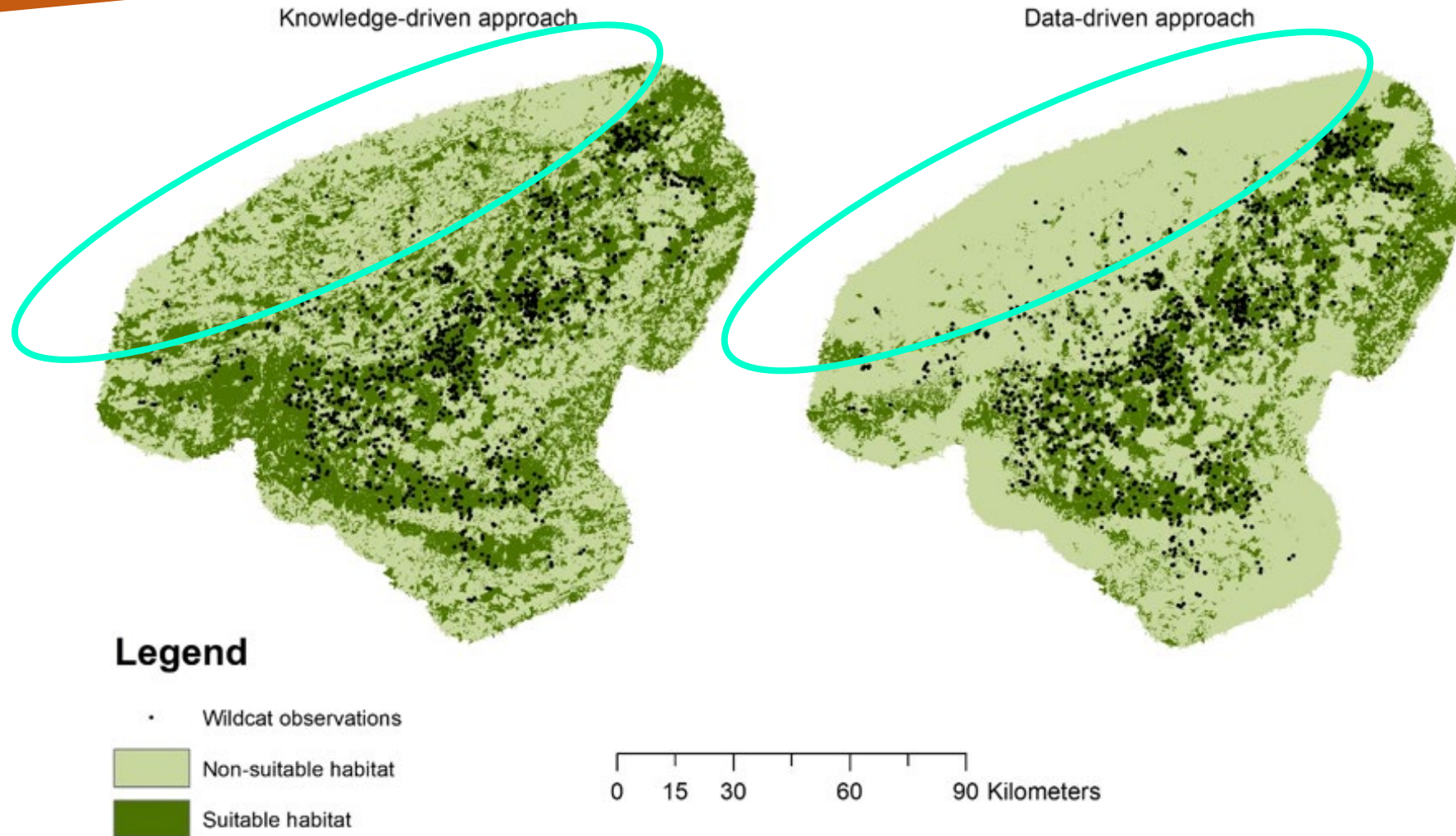> Land-cover map with coherent landscape entities (ecotopes)

> Important data-base with environmental predictors useful for ecological modeling

Really important for the continuity of habitat and land-cover
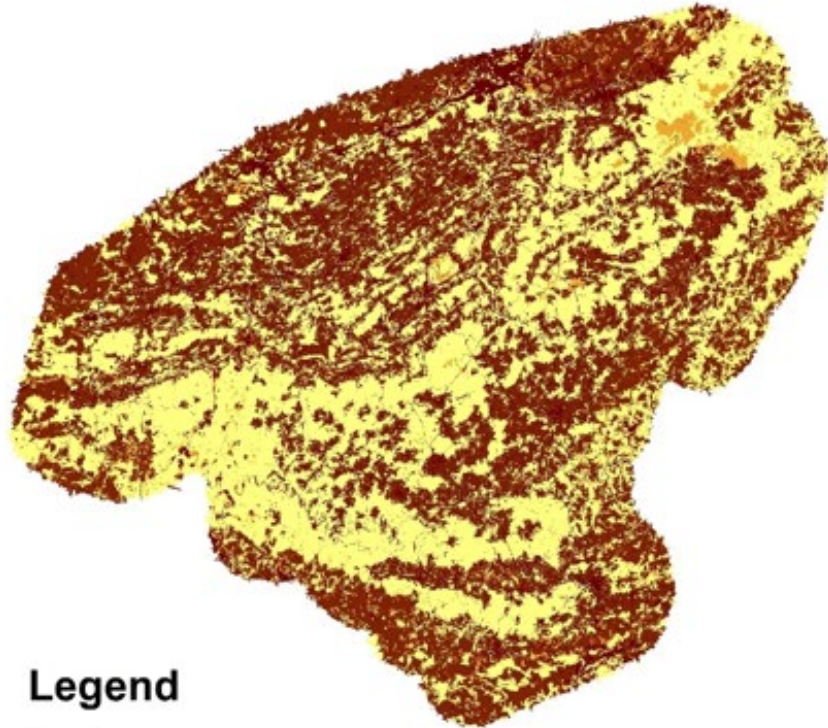
Powerfull data-base to perform accurate SDM

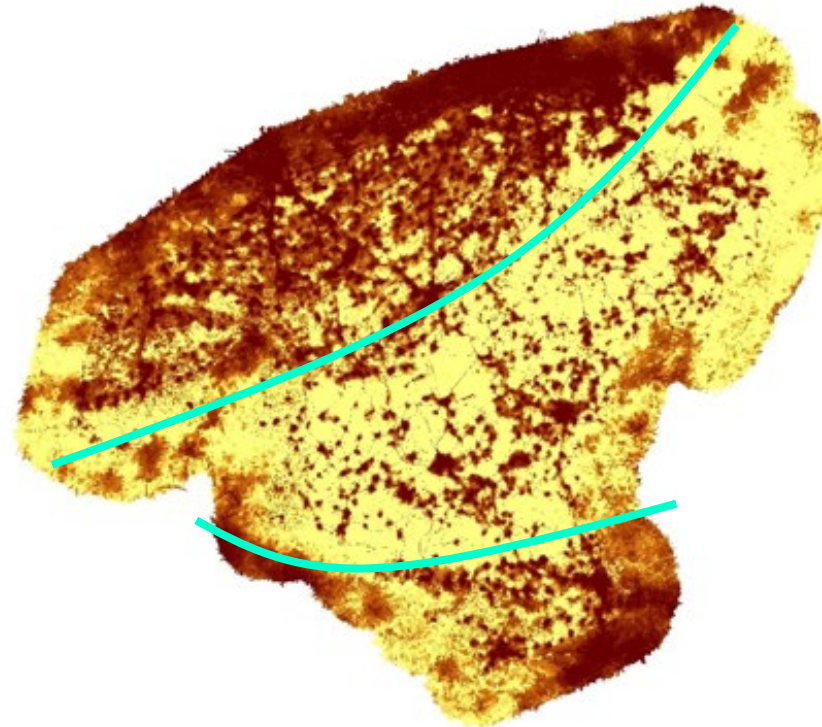Nassogne

Wildcat potential habitat to identify network nodes

Knowledge-driven approach

Data-driven approach

Legend

· Wildcat observations

Non-suitable habitat

Suitable habitat

0   15   30   60   90 Kilometers

Resistance map to perform least cost path analysis
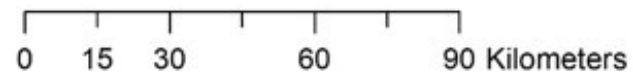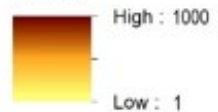
Habitat network and corridors cumulated cost
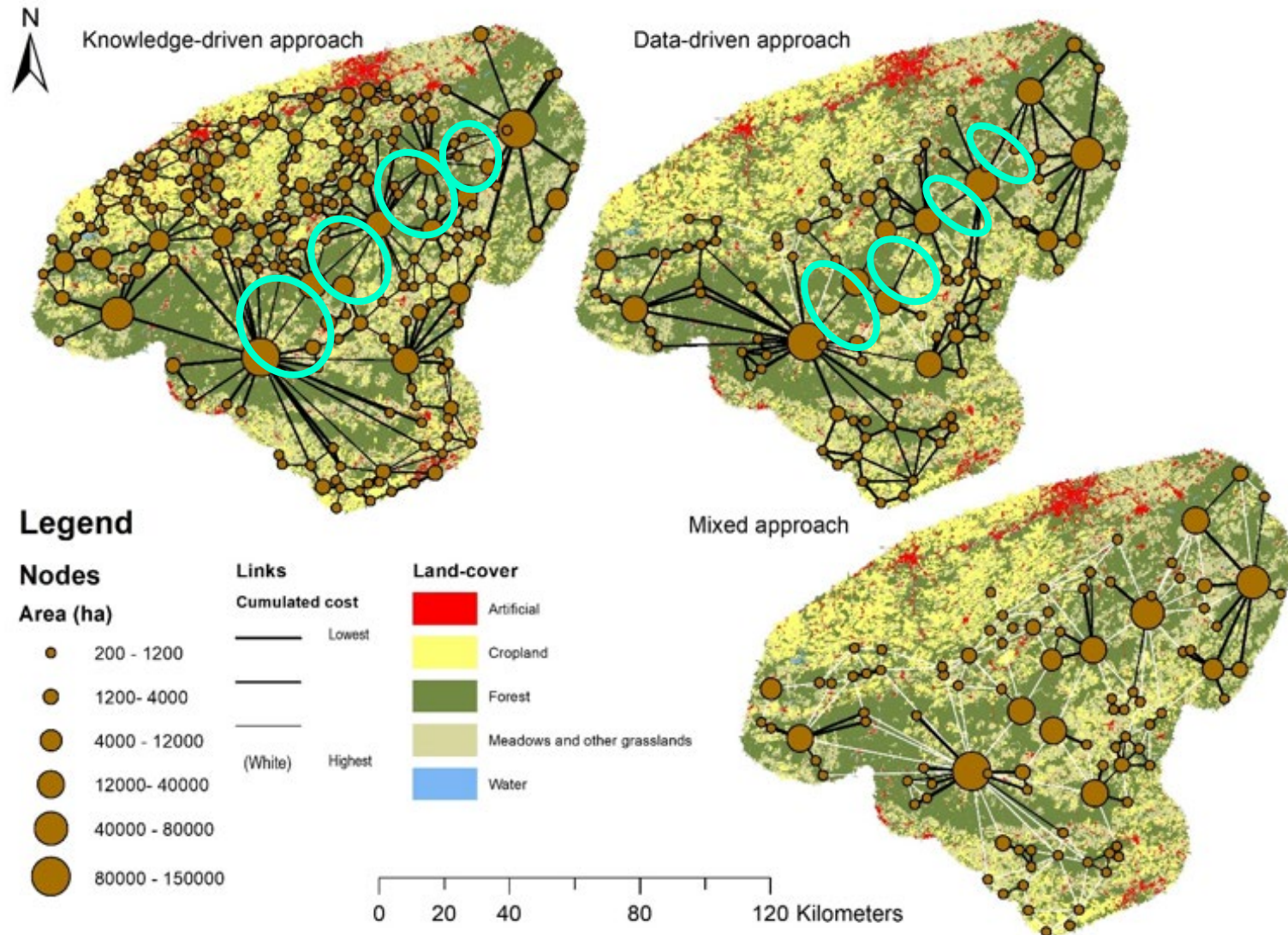
Habitat network elements priority

Knowledge-driven approach

Data-driven approach

Mixed approach

Legend

Land-cover
LCCS_Simpl
- Artificial
- Cropland
- Forest
- Meadows and other grasslands
- Water

Nodes
Area (ha)
- 200 - 1200
- 1200 - 4000
- 4000 - 12000
- 12000 - 40000
- 40000 - 80000
- 80000 - 150000

Nodes
Priority
- 1 (High)
- 2
- 3
- 4 (Low)

Links
Priority
- 1 (High)
- 2
- 3
- 4 (Low)

0   20   40   80   120 Kilometers
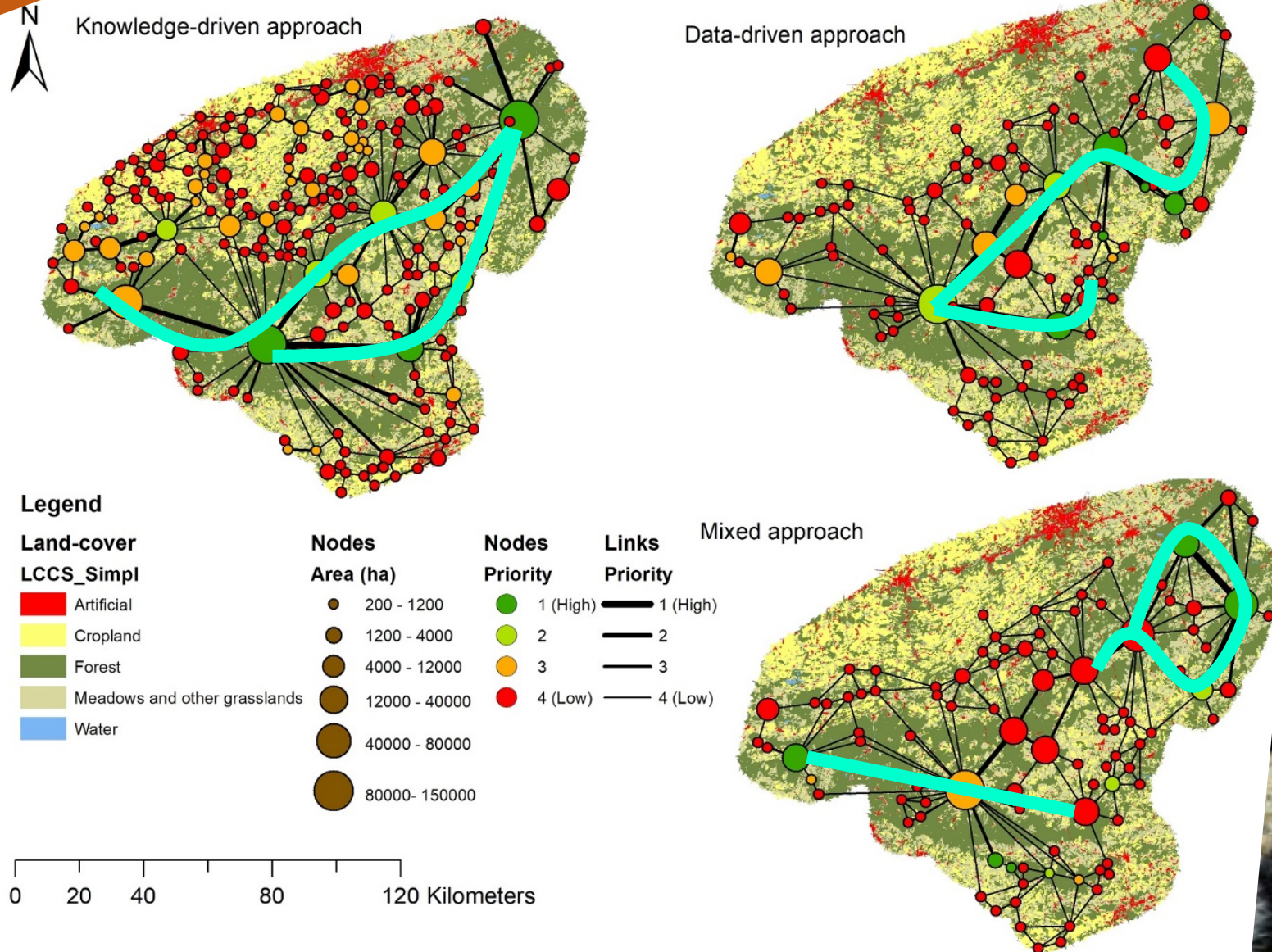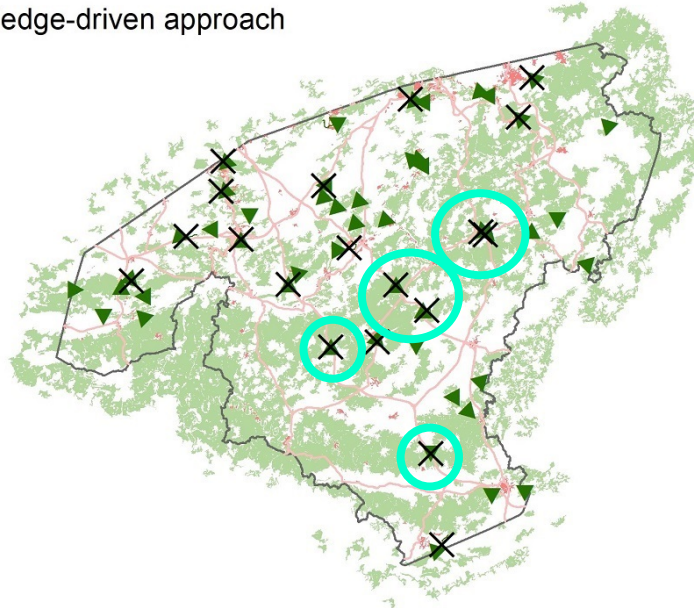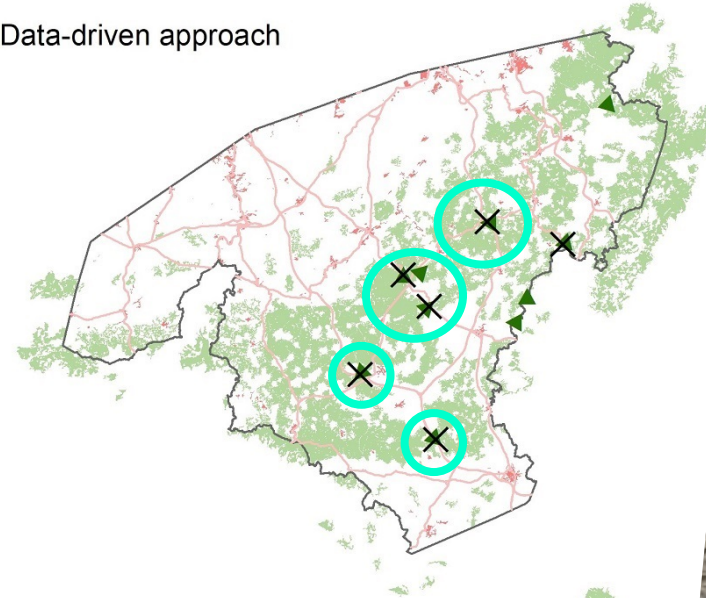
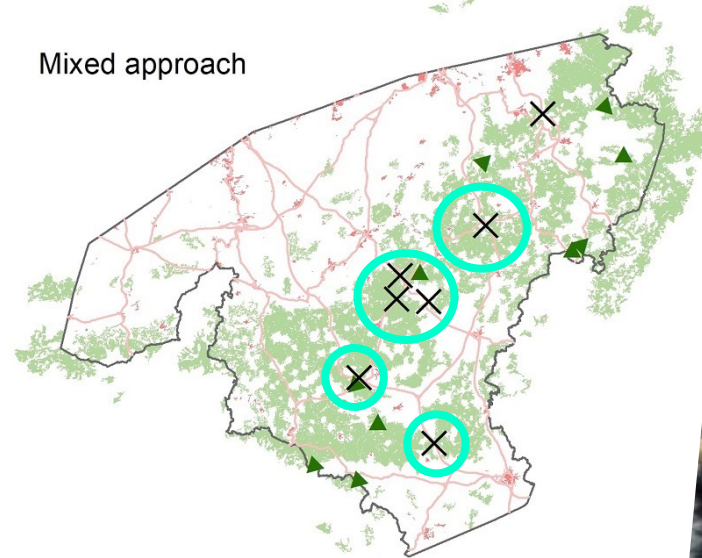# Important conflicts between roads and major corridors

Knowledge-driven approach

Data-driven approach

Mixed approach

N

Legend

✕   Conflicts between roads and corridors

🟩   Habitat patches

▲   Corridors to be maintained

🟥   Urban areas

—   Major highways
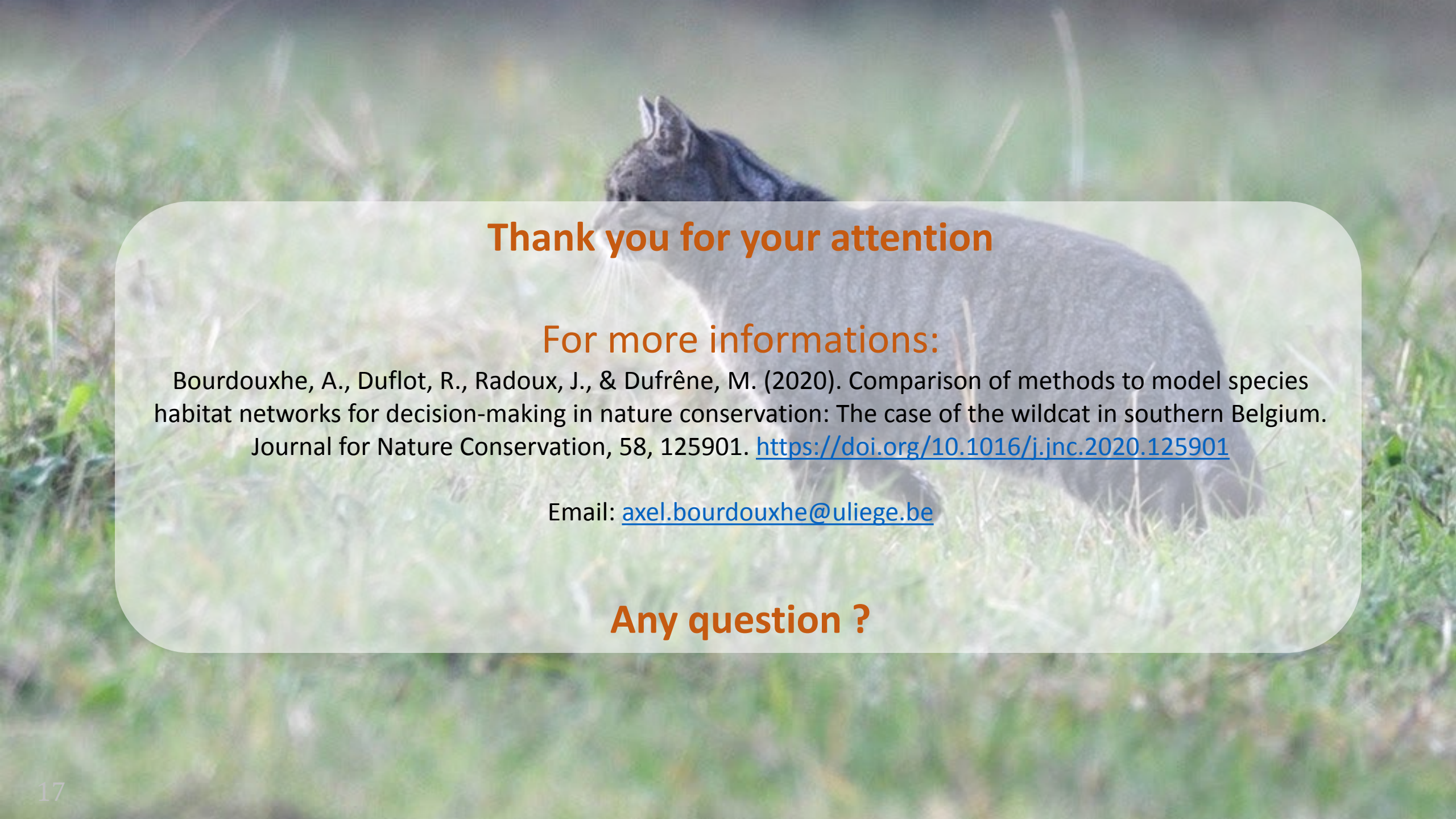
⬜   Study area

0   15   30   60   90 Kilometers

Takehome message

➢ Data-driven approach identifies habitat areas more precisely and in accordance with the ecology of the species.

➢ However, data-driven and knowledge-driven approaches globally identify the same corridors and priority habitat areas for the ecological network

➢ The mixed approach largely differed in that it required more inputs to be performed

➢ Our study also identified the main obstacles to the dispersion of the wildcat in Wallonia

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Thank you for your attention

For more informations:

Bourdouxhe, A., Duflot, R., Radoux, J., & Dufrêne, M. (2020). Comparison of methods to model species habitat networks for decision-making in nature conservation: The case of the wildcat in southern Belgium. Journal for Nature Conservation, 58, 125901. https://doi.org/10.1016/j.jnc.2020.125901

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Any question ?