Gembloux Agro-Bio Tech
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Combining ecotope segmentation and remote sensing data for biotope and species distribution modelling

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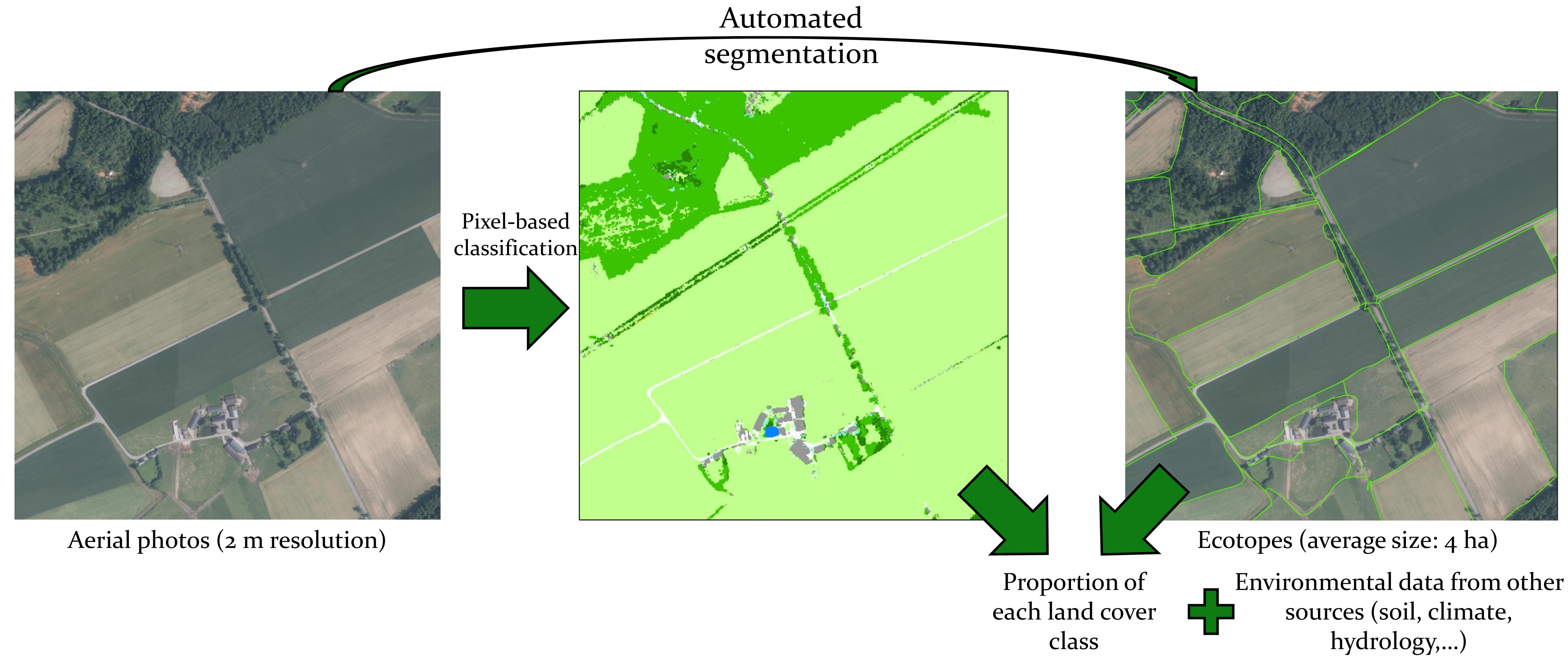
Biotope and habitat suitability modelling are increasingly used in biodiversity monitoring and conservation planning. However, ecological modelling requires an extensive amount of environmental data. In the Lifewatch-WB project, a database combining segmentation in homogeneous landscape units (ecotopes), environmental attributes derived from regularly updated remote sensing data and other data sources has been designed.

Our objective was to assess the usefulness of this ecotope database for biotope and species distribution modelling.

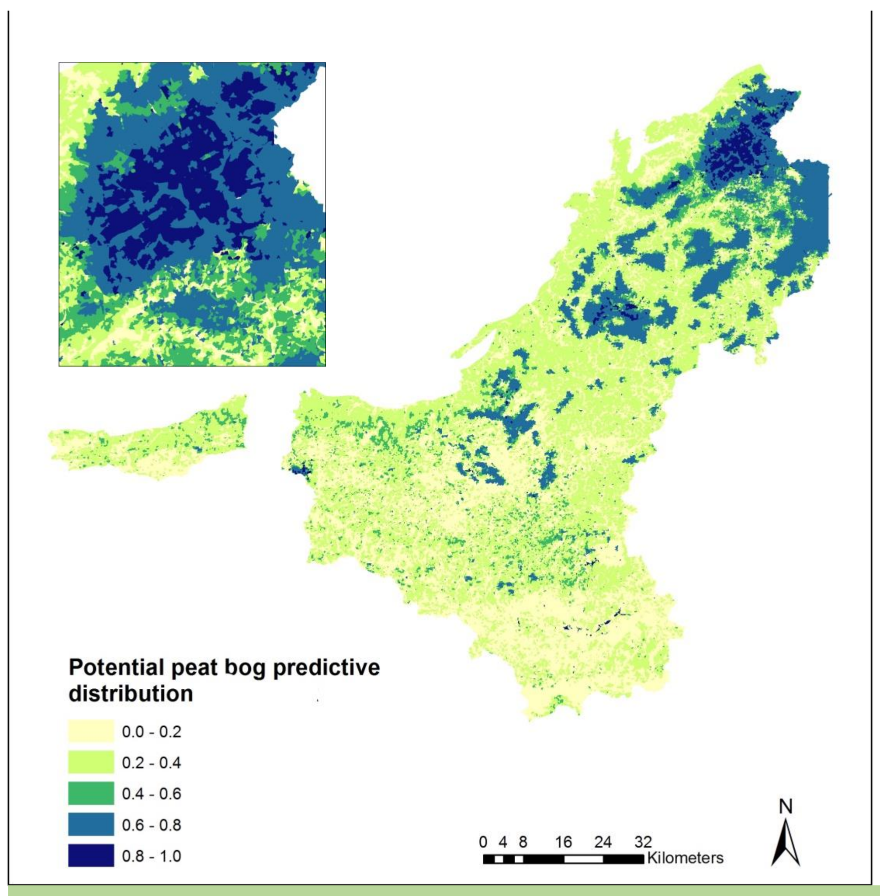
"An **ecotope** is an ecologically homogeneous tract of land at the scale level being considered" (Zonneveld, 1989)

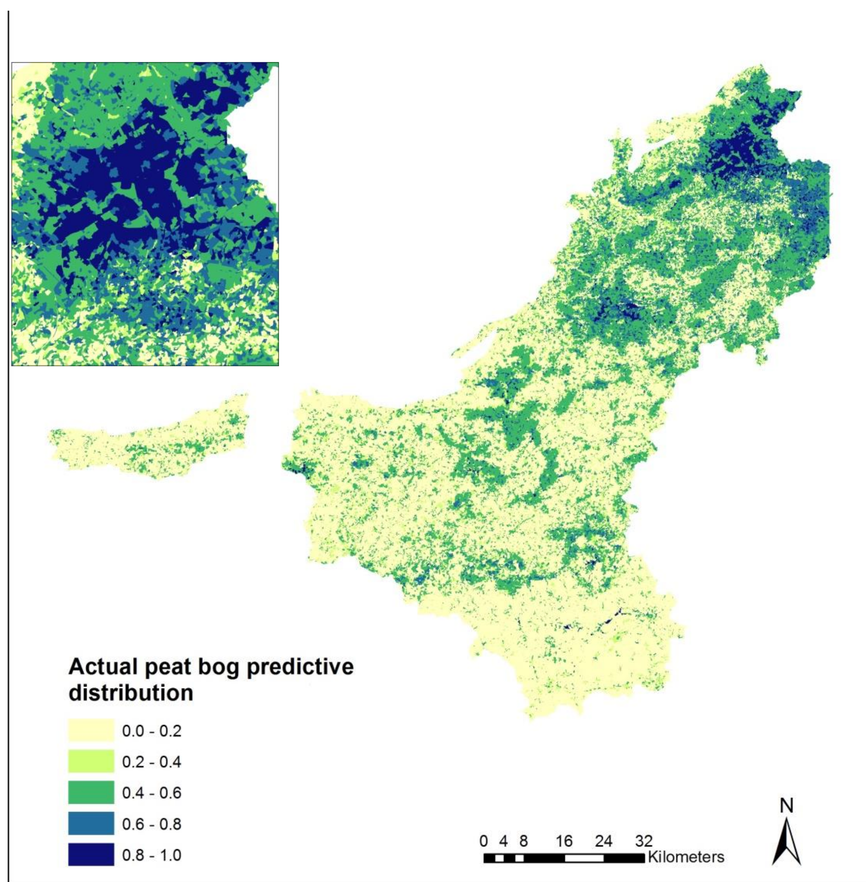


Study area: South-East Belgium (Ardenne & Lorraine bioregions)
Spatial join between biological data and the ecotopes
Algorithm used: Random Forest

Peatbog modelling

- Biological data: Natura 2000 Habitats layer
- Potential peat bog mapping: climatic, edaphic and topographic variables
- Actual peat bog mapping: addition of land cover variables





The potential peat bog mapping shows more large patches of high favorable conditions (blue area) while the actual peat bog mapping shows smaller patches. These blue areas are interesting for a restoration program.

Habitat suitability modelling for the cranberry fritillary butterfly

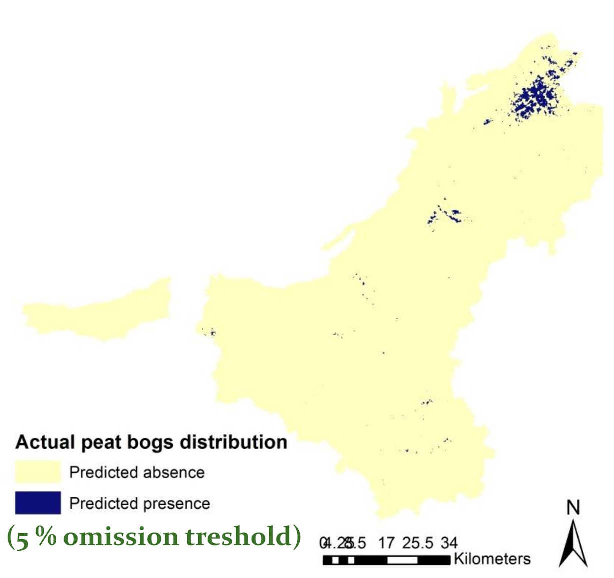
- Occurrences obtained from the Lycaena working group - Observatory of Fauna, Flora and Habitats (DEMNA)
- Climatic, edaphic and land cover variables
- Comparison ecotopes/regular grid (200 m resolution)

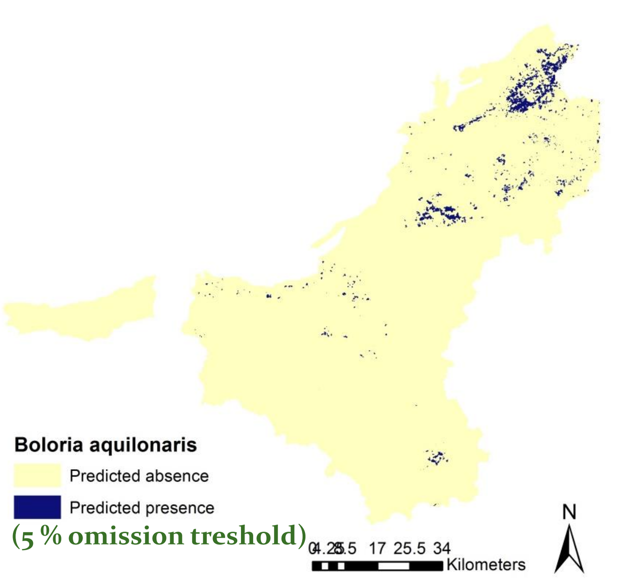
→ Excellent model performance (AUC>0.95) in both cases
→ Ecotopes reflect more closely ecological boundaries

The cranberry fritillary butterfly (*Boloria aquilonaris*), indicator of peat bogs (Indval = 8.3 %)

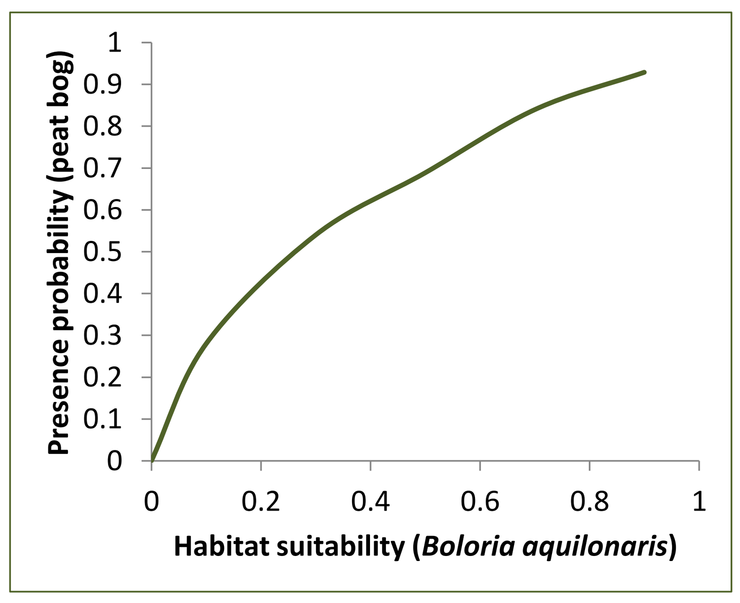
Comparison of predicted suitable area (5 % omission treshold – in white) based on the ecotopes (left) and a regular grid (right): the ecotopes delineate suitable habitats more precisely while the use of a regular grid leads to the inclusion of neighbouring unsuitable areas (intensive pasture, buildings).

Comparison between biotope and habitat suitability modelling





The predictive maps of both models partly overlap, but the predicted distribution of the bog fritillary extends beyond peat bogs. Indeed, while this species shows a preference for peat bogs, it can also be found in other wetlands. However, the predictions of both models were positively correlated (r=0.38). This suggests that when the species is found outside peat bogs, it is found in habitats with similar characteristics.



Conclusion

The use of ecotope segmentation combined with environmental data derived from remote sensing provides high quality biotope and habitat suitability models. The results of biotope and habitat suitability models were positively correlated. This suggests that biotope prediction could be used as a predictor in habitat suitability models as a proxy for other environmental variables.