EU-Scale Data for Zonation

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1 Overview

This folder contains a curated dataset tailored for educational purposes within the Zonation software framework. The dataset has been processed and organized to facilitate learning and experimentation. It was built mostly using freely available data that are properly referenced in this document. The main objective was to provide an accessible resource for educators and students to explore Zonation's capabilities and deepen their understanding of relevant concepts in spatial conservation planning at large spatial scales. Please be aware that this dataset (or at least part of it) may not align with the requirements of real-world research. Please acknowledge this repository and all included materials when using them for teaching. All rasters are stored as GeoTIFF files, and all layers are georeferenced to the WGS84 coordinate reference system (EPSG:4326).

Cite as: Joel Jalkanen, Thiago Cavalcante, Ilmari Kohonen, Ilkka Kivistö, Elina Virtanen, Tuuli Toivonen, Joona Lehtomäki, Peter Kullberg, Heini Kujala & Atte Moilanen (2024) Zonation software training set with the European data.

2 Species distribution models

Species distribution models (SDMs) were retried from the "EU-Trees4F" dataset (Mauri et al. 2022). This dataset includes current and future distributions of 67 tree species across Europe at a 10 km spatial resolution. Models selected here are based on a "SDM ensemble mean that projects the consensus model for every single RCM, and a posteriori average of the outputs of the 11 SDMs". This means that they used 11 regional climate models simulations. The authors constrained the predictions for the current time in order to account for factors such as dispersal limitations (Figure 2.1). For future projections, I selected only one representative concentration pathway (RCP 8.5), and the time period centered around 2065.

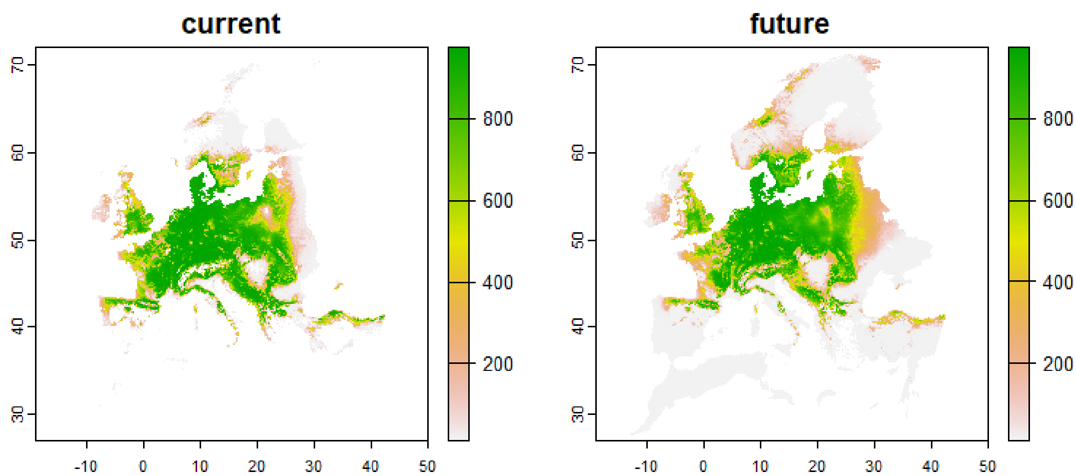

Figure 2.1: Example illustrating the comparison of current and future distribution models for the European beech (Fagus sylvatica).

3 Other input layers

3.1 Administrative units

To process the administrative units layers, I used the the geospatial data of Europe from GISCO in 1:60 million scale from year 2016. Open data from Eurostat are accessible through the *eurostat* R package. I intentionally excluded some countries, as well as overseas territories (e.g., Canary Islands and the Azores) from the NUTS-2 regions (Figure 3.1). Filtered out countries and overseas territories are available in the CSV file named `filtered_oversea.csv`. Values in the administrative units raster range from 1 to 35, and country identification is available in a CSV file named `countries_id.csv`.

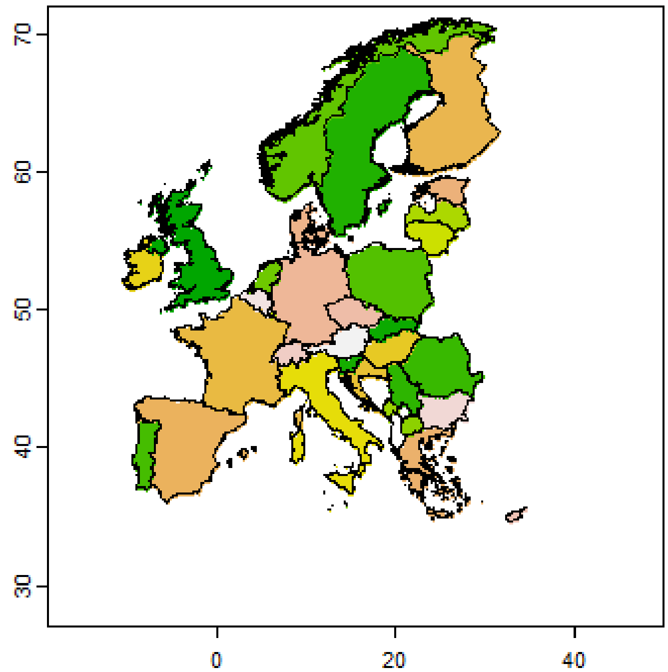

Figure 3.1: European administrative units raster.

3.2 Area mask

I processed the area mask layer using the boundaries delineated by the administrative units layer.

3.3 Hierarchic mask

3.3.1 WDPA

For this hierarchical mask layer, I used the spatial boundaries of protected areas from the World Database on Protected Areas WDPA (April 2024 version), available at ProtectedPlanet. The WDPA dataset was filtered to encompass exclusively terrestrial and inland waters within the European region falling under IUCN Categories Ia, Ib, or II. Shapefiles were then processed to correct topological errors, and to remove unnecessary vertices while preserving essential shape characteristics. The shapefiles were rasterized based on the fraction of a cell covered by the polygons. Specifically, cells with 50% or more coverage were assigned a value of 1.

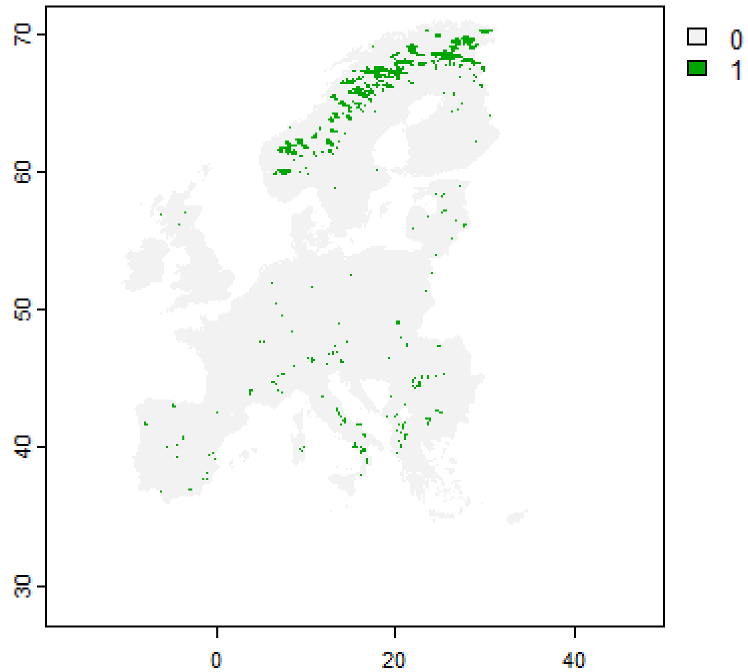

Figure 3.2: Hierarchical mask layer depicting protected areas in Europe under IUCN Categories Ia, Ib, and II.

3.3.2 Natura 2000

The second hierarchical mask layer was retrieved from the dataset: OpenStreetMap+ Protected nature areas in continental Europe (Witjes and Parente 2022). It depicts the Natura 2000 protected areas network with a focus on protection status A. Specifically, it highlights SPAs (Special Protection Areas), which are sites designated under the Birds Directive. Please note that the original raster was reprojected, resampled, and masked to match all other layers.

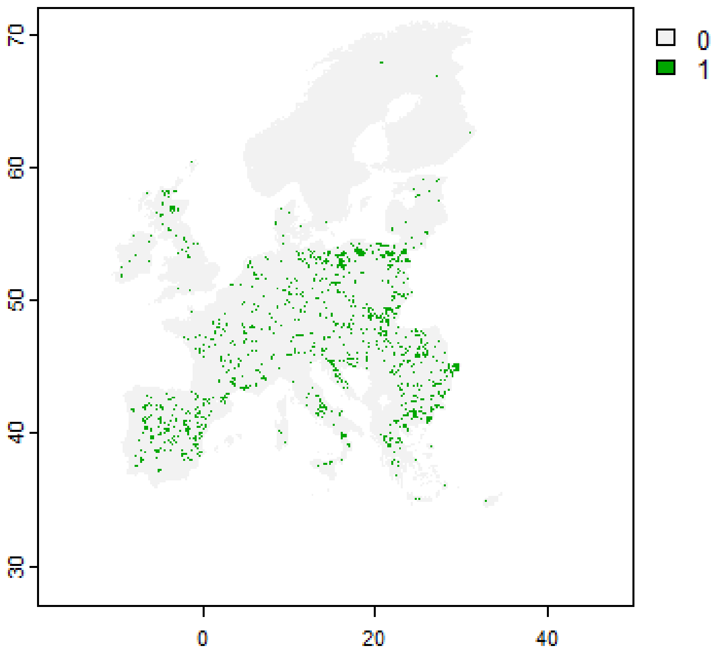

Figure 3.3: Hierarchical mask layer depicting the Natura 2000 protected areas network with a focus on protection status A.

3.4 Global Human Modification

The Global Human Modification dataset (gHM) delivers a comprehensive measure of human alteration of terrestrial lands across the world, with an original resolution of one square-kilometer. The gHM values range from 0 to 1.0, and they are calculated by estimating the proportion of a particular location or pixel that has been modified, along with the estimated intensity of such modification associated with a specific type of human modification or stressor (e.g., human settlement, agriculture, electrical infrastructure). The data was retrieved and processed using Google Earth Engine (Figure 3.4).

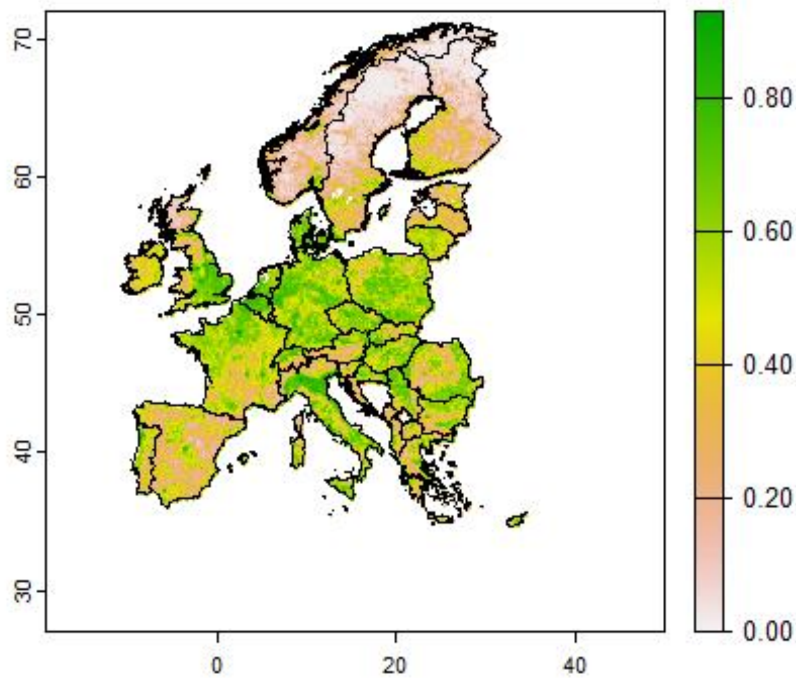

Figure 3.4: Global Human Modification.

3.5 Normalized Difference Vegetation Index (NDVI)

Normalized Difference Vegetation Index is a numerical indicator used to assess and quantify the density and health of vegetation. It is based on the difference between near-infrared and red light reflected by plants. I used here the latest version of the GIMMS NDVI dataset , named NDVI3g (third-generation GIMMS NDVI from AVHRR sensors). The data was retrieved and processed using Google Earth Engine, focusing on the period spanning from January 1st to December 31st, 2020, to capture annual phenological variation. The values of NDVI that usually range from -1 to 1 were rescaled from 0 to 1 to be used, for example, as a conditional layer in Zonation.

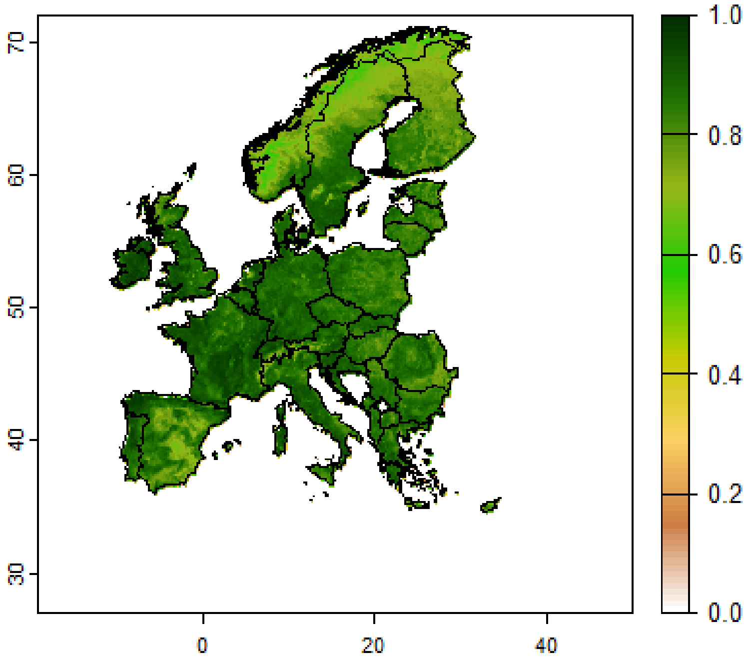

Figure 3.5: Normalized Difference Vegetation Index (NDVI) for Europe in 2020. High NDVI values typically indicate dense and healthy vegetation cover.

References

Mauri, Achille, Marco Girardello, Giovanni Strona, Pieter SA Beck, Giovanni Forzieri, Giovanni Caudullo, Federica Manca, and Alessandro Cescatti. 2022. "EU-Trees4F, a Dataset on the Future Distribution of European Tree Species." Journal Article. *Scientific Data* 9 (1): 37.

Witjes, Martijn, and Leandro Leal Parente. 2022. "OpenStreetMap+ Protected Nature Areas in Continental Europe (IUCN Status + Natura 2000)." Dataset. https://doi.org/10.5281/zenodo.6421437.