Life-Prognoses - Action A.1.12

Compilation of existing mapping products: methodology and results

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1 Introduction

This report covers the content of Action A.1.12 “Compilation of existing mapping products” within the LIFE Prognoses Project.

The aim of the of the action was to compile a GIS database of existing maps of old growth forests in Europe with a specific focus on Beech Forests.

Sabatini et al (2018) have done already a comprehensive work on the collection of different data sources and spatial datasets. Together with the DG Environment and Joint Research Centre initiative (JRC) the first database was updated an published 2020 (Sabatini et al., 2020). This European Primary Forest Database EPFD v2.0 was used as input data for this report, as it is the most comprehensive dataset on primary forests in Europe, even if it still has knowledge gaps.

The geodatabase harmonizes 48 different, mostly field-based datasets of primary forests, and contains 18,411 individual patches (41.1 Mha) spread across 33 countries. The database contains information about name, location, naturalness, extent, dominant tree species and the surrounding landscape (biogeographical regions, protection status, potential natural vegetation, current forest extent) if available (Sabatini et al., 2020).

This study here wants to answer the following questions:

- To which extent are beech forests included in the EPFD?
- How were the datasets recorded (remote sensing, field work, combination of both)?
- How precise is the delimitation of the beech-forest polygons?

With this analysis we want to get a better understanding of the EPFD and if and how the polygons in the database can be used for ground truthing of remote sensing approaches and if a total percentage of beech forests within the areas covered in the database can be calculated.

Forests outside the database have not been part of the analysis and this study was not designed as a completeness check of the data.

2 Methodology

In a first step, the data were examined and a selection was made as to which data were suitable for further analysis. Since only polygon datasets are suitable as reference datasets for further analyses or automated classifications, the point data and data without geometry were not examined further. Furthermore, based on the document "DATASET_overview_v2.0_20201030", which contains the metadata of the geodatabase, the method used to collect the datasets was investigated. Three collection methods were found: Remote sensing, literature review, and fieldwork. Remotely sensed data were excluded from further analysis because they were generated from reference training data and cannot be used as a reference dataset.

In the EPFD v2.0there are three columns containing the dominant tree species of a forest area, as well as a column indicating the forest type. All data having "fagus" (beech) in one of the three tree species columns or belong to forest type 6 (= Lowland beech) or 7 (= Montane beech) were included in the analysis, as this study is only concerned with beech forests.

The following table provides an overview of which data sets were analysed further and why the other data were excluded from further analysis (see Table 1).

Table 1: Overview EPFD v2.0 - Selection of data sets for further analysis

ID	DATA COVERAGE	SHORT NAME	SELECTION	REASON FOR NOT SELECTING
0	Europe	LitReview	0	point geometry
1	Albania, Romania, Ukraine, Macedonia	Forest Ecology Group CULS	1	
2	Bosnia and Herzegovina, Montenegro	LomJanPerBio	1	
3	The Balkan range and Rhodopes Mountain, Bulgaria	WWF - Old Forests in Bulgaria	1	
4	Bulgaria, Pirin National Park and Rila National Park	BULGARIA-Conifers	1	
5	Croatia	CroatianOGForest	1	
6	Czech Republic	CZ_oldgrwoth_forests	1	
7	Denmark	Oldgrowth & long untouched forests of Denmark	0	point geometry
8	Estonia	Old-growth-Estonia	0	point geometry
9	Large scale data (17 EU Countries)	BEECH_HVF_EU	0	point geometry
12	Finland	FinnishOGForests	0	no beech polygons
13	France (Mediterranean Ecoregion)	WWF France	1	
14	France	FR-RNF	1	
15	Germany	STRICD	1	
16	Dataset of forest service in region of Macedonia (west, central & east)	GREEK DATASET	1	
17	Hungary	Primary forest stands of Hungary	0	no geometry
18	Italian National Parks (23 Parks as in 2008)	ItalyNP	1	

ID	DATA COVERAGE	SHORT NAME	SELECTION	REASON FOR NOT SELECTING
19	Lithuania	Database of natural forests in Lithuania	0	no beech polygons
20	Mavrovo National Park, North Macedonia	PriMaFor	1	
21	Norway	Norwegian dataset	0	no beech polygons
22	Poland	OGPOL	1	
23	Mainland Portugal	OldForestsPT	0	no beech polygons
24	Madeira Island, Macaronesian Region	Laurissilva_PT_forest	0	no beech polygons
25	Romania	WWF_Romanian Virgin/Quasi virgin forests	1	
26	Slovakia	Prales Database	1	
27	Slovenia	Grafični prikaz gozdnih rezervatov	1	
29	Dalarna and Gävleborg counties, Sweden	Dynamic edge effects on Boreal forest (Sweden)	0	point geometry
30	Switzerland	WSL-ETH Forest Reserve Network	1	
32	Ukrainian Carpathians and Polissia region	OGF/VF/NF UA	1	
33	Romania	Official Romanian catalogue of virgin and quasi-virgin forests	1	
34	Albania, Austria, Belgium, Bulgaria, Croatia, Germany, Italy, Romania, Slovakia, Slovenia, Spain and Ukraine	UNESCO WHC Beech Forests	0	no geometry
35	Beech forests of Europe	European Beech Forest Network (EBFN) sites	0	point geometry
36	Netherlands, Serbia, Norway	OGF Collection	1	
37	the French slope of the Pyrenees range	GEVFP	1	
38	Finland, Province of Kainuu	Kainuun vanhat metsät	0	no beech polygons
39	Finland	Kansallisomaisuus turvaan	0	no beech polygons
40	Dundaga and Usma parish/ Latvia	Slitere-Moricsala	0	no beech polygons
41	La Gomera, Canary Islands	Garajonay	0	no beech polygons
43	Norway	Foreslåtte verneområder	0	no beech polygons
44	Central Serbia	Serbia Beech OGF	1	
45	Autonomous Province Vojvodina of Serbia	OldGrowthForVojvodinaSRB	1	
46	Belovezhskaya pushcha National Park, Berezinski biosphere reserve, Olmany reserve in Belarus	ODF in Belarus NPs	0	no beech polygons
47	Albania	ALBPRIFOR	0	point geometry
48	Austria	Potential OGF and primary forest in Austria	0	no geometry
49	Upper Austria	Kalkalpen Nationalpark	1	
50	Montenegro	VF Montenegro	1	
51	European Russia	Primary Forests of European Russia	0	polygons based on remote sensing evaluation

ID	DATA COVERAGE	SHORT NAME	SELECTION	REASON FOR NOT SELECTING
52	Catalunya, Castilla La Mancha, Castilla y León (Spain)	RedBosques	0	point geometry
53	Bosnia and Herzegovina	Primary forests in Bosnia	0	point geometry
54	Albania/north-east/beech forest	Old beech forest in Albania	1	
55	Southern Italy	ParchiSud	1	
/	Norway	Viktige Naturtyper	0	Data not yet part of the database
/	Sweden	Potential PrimaryForests Sweden	0	Data not yet part of the database; polygons based on remote sensing evaluation

For each of the remaining 27 data sets, five beech forest polygons were randomly selected and the data quality analysed. In those countries where there were fewer than 5 beech forest polygons, all existing polygons were considered. It was analysed whether the polygons were purely old-growth forest polygons (OGF) (based on expert classification from Google-Images) or whether the polygons also contained obviously managed areas. Attention was also paid to whether other land cover classes were included in the polygon. In addition, if polygons were found that contain no or hardly any beech trees.

The polygons were categorised into the following 4 classes:

Table 2: Evaluation classes

A	Precise delineation of pure and mixed Beech OGF polygons
B	Polygons contain managed and OGF mixed Beech OGF polygons
C	Pure and mixed Beech OGF mixed with other forest types and/or landcover types (Rocks, lakes, meadows, road, houses, fields...)
X	No or hardly any beech trees in the polygon.



Figure 1: Examples for class A "Precise delineation of pure and mixed Beech OGF polygons"

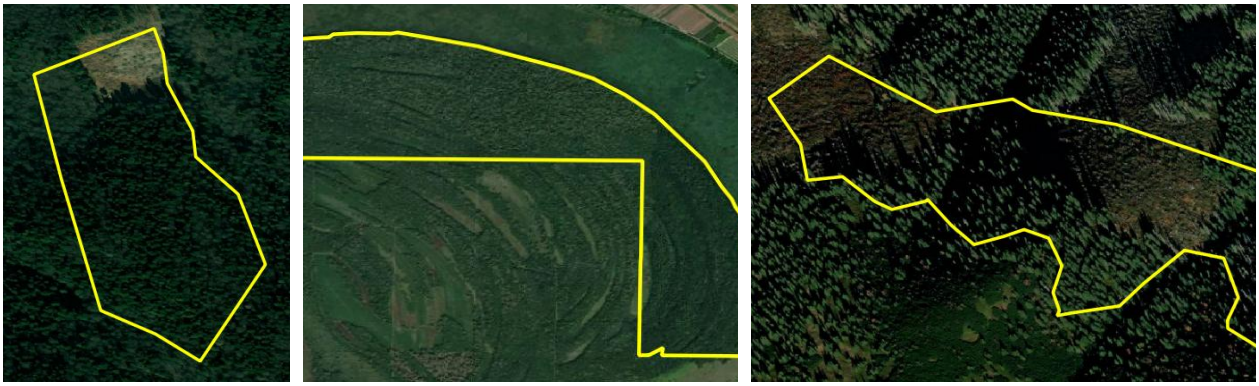


Figure 2: Examples for class B "Polygons contain managed and OGF mixed Beech OGF polygons"

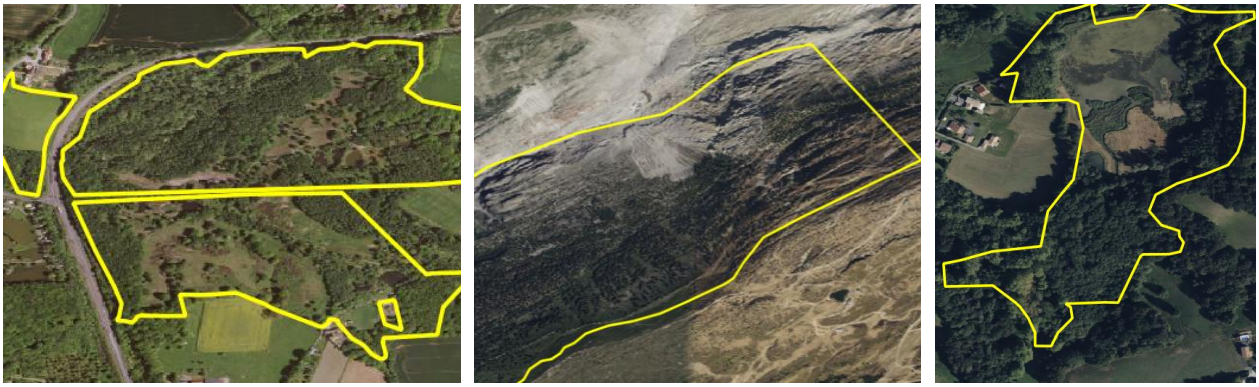


Figure 3: Examples for class C "Pure and mixed Beech OGF mixed with other forest types and/or landcover types"



Figure 4: Examples for class X "No or hardly any beech trees in the polygon"

3 Results/Discussion

The first step was to analyse which beech forest data sets from the EPFD v2.0 are located in our project areas. The following table provides information on this.

Table 3: EPFD v2.0 data sets by project areas of the LIFE PROGNOSES project.

COUNTRY	CLUSTER NAME	SABATINI-DATA
Austria	Kalkalpen	49 - Upper Austria
Belgium	Sonian Forest	/
Bulgaria	Central Balkan	3 - The Balkan range and Rhodopes Mountain, Bulgaria
Germany	Grumsin	15 - Germany
	Hainich	15 - Germany
	15 - Germany	15 - Germany
	Serrahn	15 - Germany
Italy	Abruzzo, Lazio & Molise NP	18 - Italian National Parks (23 Parks as in 2008)
Slovenia	Krokar	27 - Slovenia
	Snežnik-Ždrocle	27 - Slovenia
Ukraine	Carpathian Biosphere Reserve Chornohora	32 - Ukrainian Carpathians and Polissia region
	Carpathian Biosphere Reserve Kuziy-Trybushany	32 - Ukrainian Carpathians and Polissia region
	Carpathian Biosphere Reserve Maramorosh	32 - Ukrainian Carpathians and Polissia region
	Carpathian Biosphere Reserve Svydovets	32 - Ukrainian Carpathians and Polissia region
	Carpathian Biosphere Reserve Uholka-Shyrokyi Luh	32 - Ukrainian Carpathians and Polissia region

The further data analysis revealed that approximately half of all polygons fall into class A (Precise delineation of pure and mixed Beech OGF polygons). 36 % of all randomly selected polygons fell into class C (Pure and mixed Beech OGF mixed with other forest types and/or landcover types). The remaining polygons are divided between classes X and B at 8% each.

Table 4: Distribution of quality classes (%)

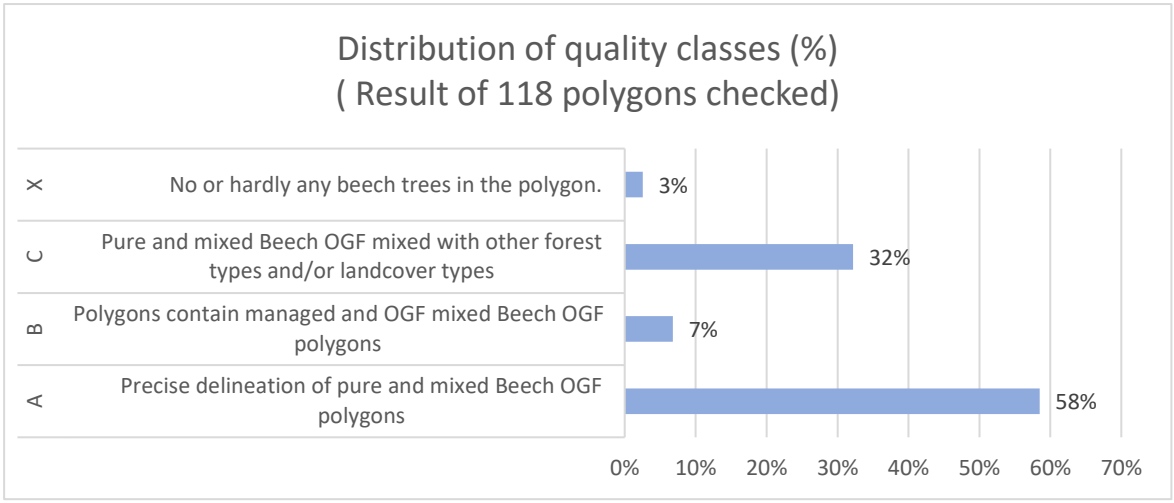


Table 5 on page 10 provides a closer look at the distribution of the individual classes by dataset. The data sets that are located in our project areas are highlighted in grey. It is noticeable that there are a few data sets in which all 5 randomly selected polygons fall into class A, which is the class only containing OGF beech forest polygons without any other landscapes or managed forests. These include the data sets: 5 - Croatia, 13 - France (Mediterranean Ecoregion), 27 - Slovenia and 44 - Central Serbia.

To summarise, the polygons from the EPFD v2.0 dataset can only be used to a limited extent as remote sensing reference data for old growth forests. Polygons containing managed forests would have to be filtered out or labelled and other data would have to be revised, as the majority of the polygons were not clearly delineated. Very often the polygons are mixed with other land uses. Even if they are pure beech forest polygons, the polygons are often inhomogeneous and cannot be used 1:1 for remote sensing purposes.

It must also be taken into account that EPFD v2.0 is a summary dataset, integrating data of varying levels of detail (often at a low resolution) designed to map old-growth ‘zones’ broadly, conduct gap analyses, and estimate surface areas in orders of magnitude. It was never intended as ‘ground truth’ for remote sensing applications, so its limitations in this context are expected. Furthermore, it does not claim to be accurate at the plot level, making the presence of ‘false positives’ a logical consequence.

Additionally, while there is a notable amount of ‘noise’ in the EPFD v2.0, it is important to acknowledge that quantifying this noise with a specific figure may not be entirely reliable. The available sample size is too small.

Table 5: Division into classes according to datasets

ID	Data Coverage	A	B	C	X
1	Albania, Romania, Ukraine, Macedonia	1		1	1
2	Bosnia and Herzegovina, Montenegro	2		2	
3	The Balkan range and Rhodopes Mountain, Bulgaria	2		3	
4	Bulgaria, Pirin National Park and Rila National Park	3		2	
5	Croatia	**5**			
6	Czech Republic		2	3	
13	France (Mediterranean Ecoregion)	**5**			
14	France			3	
15	Germany	2	1	2	
16	Dataset of forest service in region of Macedonia (west, central & east)			5	
18	Italian National Parks (23 Parks as in 2008)	4		1	
20	Mavrovo National Park, North Macedonia	2		1	
22	Poland	2	2		
25	Romania	4		1	
26	Slovakia	**5**			
27	Slovenia	**5**			
30	Switzerland			2	
32	Ukrainian Carpathians and Polissia region	4	1		
33	Romania	3		2	
36	Netherlands, Serbia, Norway	2	2		
37	the French slope of the Pyrenees range	4		1	
44	Central Serbia	**5**			
45	Autonomous Province Vojvodina of Serbia	2			
49	Upper Austria	3		2	2
50	Montenegro			1	
54	Albania/north-east/beech forest	3		2	
55	Southern Italy	1		4	
Sum		**69**	**8**	**38**	**3**

4 References

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