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## **STAGES OF STRUCTURAL FORMATION OF THE UNESCO WORLD HERITAGE SERIAL PROPERTY "ANCIENT AND PRIMEVAL BEECH FORESTS OF THE CARPATHIANS AND OTHER REGIONS OF EUROPE"**

European beech *Fagus sylvatica* L. is distributed exclusively in Europe and if there were no human interventions, beech forests would be dominant among the landscapes of the central part of our continent. It is also interesting that this sylvatic tree species survived the last ice age only in small refugia, in the southern and south-eastern Europe, and then began to colonize large areas of the continent. Due to its ecological and biological features, over the past 4 000 years it has occupied large areas, in a wide range of ecological conditions, became part of various forest communities and spread from the sea coast in the northwest to the main mountain systems of Europe.

It is important to note that the post-glacial colonization of the landscapes by beech had been taking place in parallel with the human settlement of the territory and the rise of a developed society.

It is therefore not surprising that beech has become an important element of European culture. A series of words, such as English "book" or Slavic alphabet letter "bukva" or ABC book "bukvar" are associated with the name of this species – "buk". Many words in European languages, including the names of regions (such as Bukovyna or the Ukrainian ski resort of Bukovel) and settlements, also come from the word "buk" – beech.

But human economic activity has led to a significant reduction in the area of beech forests in Europe, and there are very few pristine, undisturbed beech forests or primeval forests. Therefore, the most valuable remnants of natural beech forests are taken under special protection in a number of countries.

In accordance with the Convention Concerning the Protection of the World Cultural and Natural Heritage, a list of cultural and natural sites of the UNESCO World Heritage Site of exceptional universal value is established on the basis of certain criteria and rigorous international scientific expertise.

Therefore, on our initiative, at the end of 2006, after intensive preparatory work done by the research teams of the Carpathian Biosphere Reserve (Ukraine) and Zvolen Technical University from Slovakia, the governments of Ukraine

and Slovakia sent a proposal to the UNESCO World Heritage Committee.

And on June 28, 2007, this intergovernmental authority, at its 31<sup>st</sup> session in Christchurch (New Zealand), with the participation of diplomats, scientists and environmentalists from various parts of the world, unanimously, without any remarks, decided to include the Ukrainian-Slovak nomination "Primeval beech forests of the Carpathians" in the UNESCO World Heritage List (Pichler V. et al 2007; Hamor 2019). It was a long-awaited, truly historic event for scientists and conservationists of Ukraine and Slovakia, and it marked the international recognition of their environmental and scientific activities.

It has also become a tribute to our peoples, who have managed to preserve these unique natural values in the heart of Europe under various complex historical and socio-economic circumstances.

Important for this kind of victory were the active conservation position and fundamental research held by many Ukrainian and foreign scientists from different eras, especially professors Alois Zlatnik (Czech Republic), Stefan Korpel, Ivan Voloschuk and William Pichler (Slovakia), Stepan and Vasyl Parpan (Ukraine), Mario Brodji and Brigitte Commarmot (Switzerland) and others (Hamor 2018).

Big contribution to this process was made by the international scientific conferences and seminars organized by the Carpathian Biosphere Reserve: "Natural forests of the temperate zone of Europe – values and uses" (Hamor 2004; Commarmot 2005; Hamor 2005) and "Identification of potential World Natural Heritage Sites" (Babenko 2004), the monograph "Primeval Forests of the Carpathians. Guidebook to the Forests of the Carpathian Biosphere Reserve" (Brandley and Dovhanych 2003) published in Switzerland in Ukrainian and German languages, a Ukrainian-Dutch project on inventory of the Transcarpathian primeval forests (Hamor et al. 2008), as well as huge support by German researchers Peter Schmidt and Harald Plachter.

The support granted by David Michalek, an expert of the International Union for Conservation of Nature (USA), was extremely important in this case.

At the first stage of designation, the Ukrainian-Slovak nomination included 77,971 hectares of beech primeval forests, 29,278 hectares of which formed the core area, and 48,692 hectares formed a buffer zone.

It was a transnational object consisting of ten separate component parts located along a 185 km long axis, from the Rakhiv Mountains and the Chornohora Range in Ukraine and further to the west along the Poloniny Mountain Range and the Bukovske Vrchy and the Vihorlat Mountains in Slovakia.

More than 52,000 hectares (of which 20,980.5 hectares belong to the core area) or almost 70% of the nomination belonged to the Carpathian Biosphere Reserve.

Part of it is still protected at the Uzhanskyi National Nature Park, and only

a fourth of it was located within Eastern Slovakia.

According to experts, this nomination has become extremely valuable on the global level as a model of undisturbed complexes of temperate deciduous forests.

It represents the most complete and continuous ecological models, which reflect the processes occurring in pure beech forests under different climatic conditions. This is a truly invaluable gene pool of European beech *Fagus sylvatica* and a number of other species associated with its distribution range.

This nomination is an extremely important site (along with the one established earlier in Japan on the island of Hokkaido, a UNESCO World Heritage Site of Japanese beech *Fagus crenata* Blume, with an area of ten thousand hectares) to recreate a complete picture of the history and evolution of the genus *Fagus*, which due to its prevalence in the northern hemisphere is globally important.

Beech is one of the most important components for the biome of temperate deciduous forests, the primeval forests of beech once used to occupy 40% of Europe, and now their fragments are an example of recolonization and development of terrestrial ecosystems and communities since the ice age – a process that is lasting today as well.

Some components of this nomination (especially Uholka-Shirokyi Luh, Chornohirsky, Svydovets and Maramures massifs of the Carpathian Biosphere Reserve) are large enough to be home for natural processes necessary for long-term life of many species and ecosystems.

It is also important that beech primeval forests grow on all soil-forming rocks found in the Carpathians (crystalline rocks, limestones, flysch, andesite), Represent 123 plant associations and have significant biological diversity. Compared to other UNESCO World Heritage sites, the Carpathian beech primeval forests are characterized by specific flora and fauna, which add ecological complexity and completeness of these ecosystems.

It is also extremely valuable, according to the World Heritage Committee's Resolution, that scientific information from nominees can already help explore the potential impact of the global climate change on Earth.

Thus, the Ukrainian-Slovak nomination "Primeval Beech Forests of the Carpathians" as a UNESCO World Natural Heritage Site was of special environmental, scientific and tourist-recreational interest, which became the basis for the creation of a European network of primeval and ancient beech forests.

The next extremely important stage in the history of the world recognition of the primeval beech forests, thanks to the active work of German scientists and conservationists, was the expansion of the Ukrainian-Slovak nomination "Beech primeval forests of the Carpathians" in 2011.

As a result, a serial transnational site of the UNESCO World Heritage Site "Primeval beech forests of the Carpathians and ancient beech forests of Germany"

was created. This new, expanded initiative was also a unique cluster-type transnational site, representing the natural distribution range of beech forests, from the highlands of the Ukrainian Carpathians to the Baltic Sea coast of the German Rügen archipelago. It included 33,670.1 hectares of core zone and 62,402.3 hectares of buffer zone. In accordance with the decisions of the UNESCO World Heritage Committee, in connection with the creation and expansion of this world heritage site, the governments of Ukraine, Germany and Slovakia were tasked the following:

First, to ensure the most effective conservation of the property, with all biotic and abiotic components, including natural habitats of more than 10,000 species of animals, plants and fungi.

To do this, the integrated management plan was designed to identify the mechanisms for their preservation and sustainable use. In particular, all economic activities are prohibited in the core area, though fire protection measures are allowed, also protection against illegal logging is ensured, preservation of monumental old trees is introduced, protection and special management of mountain meadows together with water corridors and freshwater ecosystems is secured, and research and monitoring systems are organized, etc.

Second, to organize research aimed at obtaining knowledge that can be transferred and used for sustainable, close-to-nature forest management.

Third, to use the world natural heritage status to intensify environmental education, ensure molding of environmental culture and raise public awareness on primeval forests and their values at the local, national and international levels.

Fourth, to promote the principles of sustainable use of natural resources in the areas adjacent to the World Heritage Site (including the restoration of traditional crafts, development of ecotourism, production of organic food, etc.).

Fifth, Ukraine, Germany and Slovakia are tasked to jointly explore the potential of the World Heritage Convention for further expansion of the site, with the support of IUCN and the World Heritage Center, using the component parts from other states, in order to create a full serial transnational nomination and ensure the preservation of this unique forest ecosystem.

However, UNESCO has determined that preference should be given to the international management plan for research and monitoring, given that the volume of the existing database and information collected within the components included in the serial Ukrainian-Slovak-German nomination of beech primeval forests and German ancient beech forests can help explore the effects of global climate change.

In addition to the introduction of an integrated management system, including research programs and monitoring, a European network of information and capacity building centers is being set up, including the future International Capacity Building and Research Center for Beech Forests and Sustainable Development

in the Carpathians based at the Carpathian Biosphere Reserve, in the Ukrainian mountain resort of Kvasy, which activities should focus on research and promotion of beech primeval forests.

They will serve as a basis for exchange of experience at the international level, as well as organization of joint research activities and dissemination of ecological knowledge. It should be emphasized that enlisting the primeval beech forests of the Carpathians in the World Heritage List, in general, triggered the European process of preservation of old growth beech forests.

As part of this process, in accordance with the decision of the UNESCO World Heritage Committee, with the financial support of the German government and the active participation of Ukrainian experts, a large-scale inventory and research of ancient beech forests in all European countries that belonged to the distribution ranged of this once dominant tree species has been started.

More than 100 undisturbed beech forest sites were identified; the ones with sufficient size were found in 12 beech forest regions of Europe in 23 countries (Fig. 1). Later, as a result of critical analysis, the so-called "Rakhiv short list" of ancient beech forests was formed within the framework of the international conference "Primeval and old growth beech forests of Europe: problems of conservation and sustainable use", held on September 16-22, 2013 in Rakhiv. Those sites could have been considered as potential components for the expansion of the Ukrainian-Slovak-German Property.

This list was finalized at the Vienna seminar and agreed at an interministerial meeting in May 2014 in Bonn. As a result, 47 applicants for inclusion in the World Heritage List from 20 countries are included in it.

Among them there were Ukrainian sites with primeval and ancient beech forests from the nature reserves "Gorgany" and "Roztochchia", national nature parks "Synevyr", "Enchanted Land" and "Podilski Tovtry". The most significant areas of primeval beech forests from 10 European countries successfully passed the peer review of the International Union for Conservation of Nature (IUCN) and on July 7, 2017 in Krakow, Poland, at the 41st meeting of the UNESCO World Heritage Committee they got included in initiative as the second phase of expansion of the Ukrainian – Slovak site.

By the Krakow decision of the UNESCO World Heritage Committee, the Initiative "Primeval beech forests of the Carpathians and ancient beech forests of Germany" was renamed to "Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe".

A buffer zone with a total area of 294,720.87 hectares was formed around all the component parts of the site.

And at the 44<sup>th</sup> session of the World Heritage Committee, held online on July 28, 2021 in the Chinese city of Fuzhou the Initiative was expanded once again

(Table 1).

As a result, it covers now 18 European countries (Albania, Austria, Belgium, Bulgaria, Bosnia and Herzegovina, Italy, Spain, Germany, Northern Macedonia, Poland, Romania, Slovakia, Slovenia, Ukraine, France, Croatia, the Czech Republic and Switzerland) (Fig. 2).

Its total area is 98,125.14 hectares, of 21.4% which is protected in the Carpathian Biosphere Reserve.

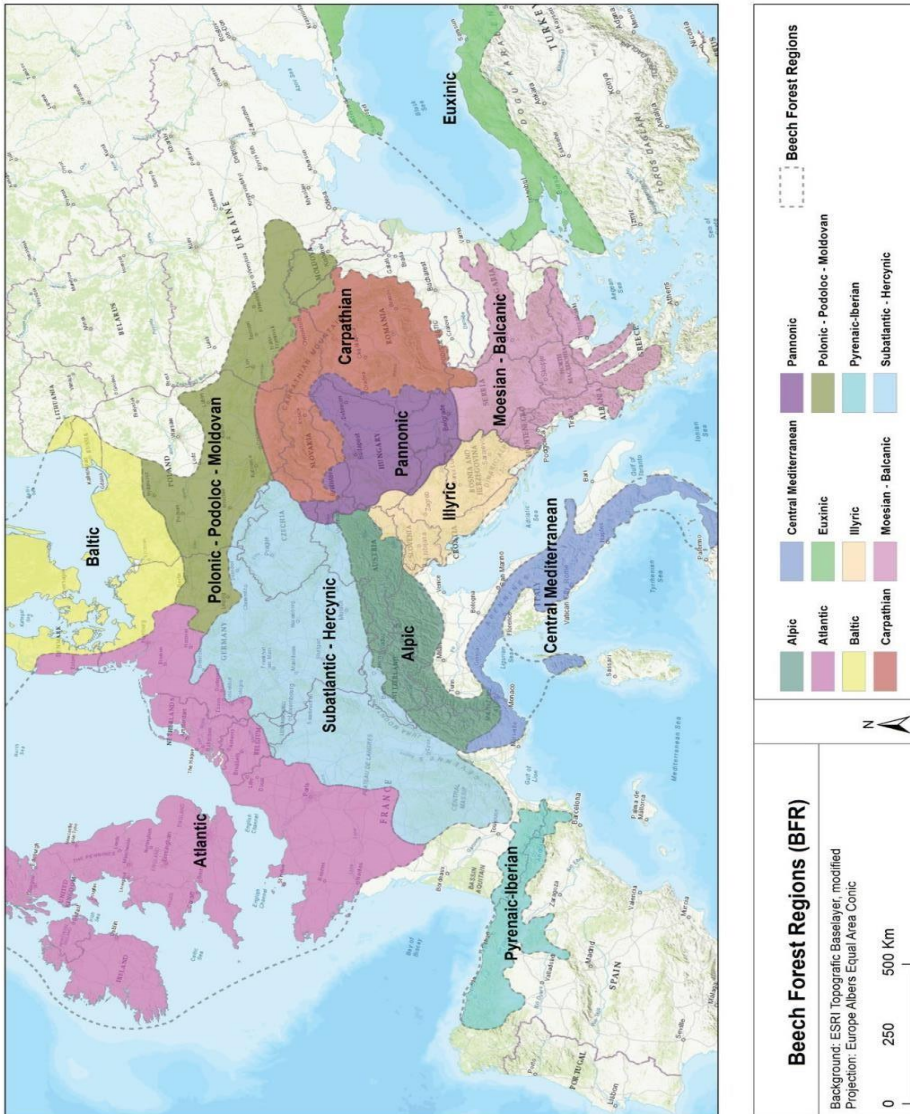
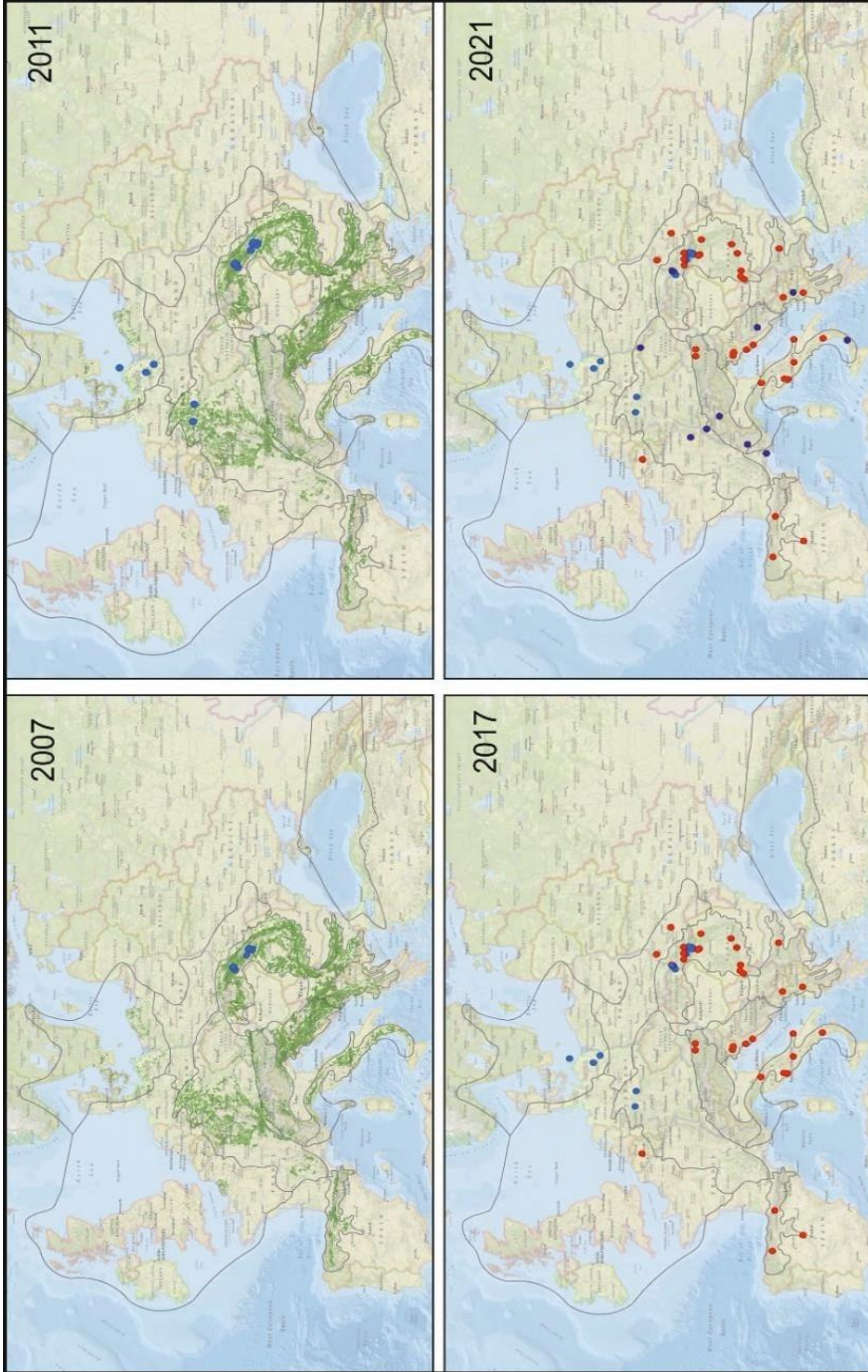


Fig. 1. Map of Beech Forest Regions (Kirchmeir, Kovarovics (eds.), 2020).





**Fig. 2.** UNESCO World Heritage Site - Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe (prepared with Yuriy Berkela's contribution).

It is also interesting that the largest of the 94 components included in this world heritage site is the continuous Uholka-Shyrokyi Luh forest massif (11,860 ha).

It should also be noted that on our proposal on February 2, 2017 in the German city of Eberswalde (Hamor 2017) representatives of scientific and environmental organizations of Germany, Britain, Austria and Slovakia, created and registered the International NGO "European Beech Forest Network", which is going to deal with conservation and research of beech primeval and ancient beech forests of Europe, as well as seek additional sources of funding and develop other mechanisms for sharing experience and information on their scientific and environmental values, solving problems of their protection in the countries concerned, etc.

It is also extremely important that the UNESCO World Heritage Committee in its decision (39 COM 7B.19) in 2015 approved the actions of Germany, Slovakia and Ukraine on close cooperation regarding preservation and management of the World Heritage Site "Primeval beech forests of the Carpathians and ancient beech forests of Germany", including the signing of the Joint Declaration of Intent between the Ministry of Ecology and Natural Resources of Ukraine, the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Construction of the Federal Republic of Germany and the Ministry of Environment of the Slovak Republic directed onto cooperation regarding the management and protection of the shared Property (Hamor 2019) and recommends that they continue to make every effort in this direction.

Acts of the President and the Government of Ukraine, which approved the complex of measures, are also of great importance for the preservation of beech primeval forests as a UNESCO World Heritage Site. These measures are aimed not only at protection, but also at ensuring sustainable development and improvement of the adjacent mountain settlements of Zakarpattia region (Hamor 2013, 2014, 2018).

A special role in the inclusion of beech primeval forests in the UNESCO World Heritage List and their research was played by the projects of the Swiss Federal Institute of Forest Snow and Landscape Research (WSL) implemented in Ukraine, which were based on successful cooperation between Ukrainian and Swiss scientists and aimed in particular on strengthening the capacity of the Carpathian Biosphere Reserve and enhancing research of primeval forest ecosystems as a whole (Hamor 2013, 2016, 2017, 2018).

In general, the experience of multilateral cooperation between scientists and conservationists in the framework of the World Heritage, according to experts, is a reference model of international environmental cooperation.

*Translated by the Author*



**Table 1.** Dynamics of the structural formation of the UNESCO World Heritage Site „Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe”. Data in the table were prepared with Yuriy Berkela’s contribution.

No.	State Party	Component part/cluster	Years of establishing (expansion) and area, ha								
			2007		2011		2017		2021		
			Area of the component part (ha)	Area of the buffer zone (ha)	Area of the component part (ha)	Area of the buffer zone (ha)	Area of the component part (ha)	Area of the buffer zone (ha)	Area of the component part (ha)	Area of the buffer zone (ha)	
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	
1.1	<b>Ukraine</b>	Uholka-Shyrokyi Luh	11860,0	3301,0	11860,0	3301,0	11860,0	3301,0	11860,0	3301,0	3301,0
1.2		Chornohora	2476,8	12925,0	2476,8	12925,0	2476,8	12925,0	2476,8	12925,0	12925,0
1.3		Svydovets	3030,5	5639,5	3030,5	5639,5	3030,5	5639,5	3030,5	5639,5	5639,5
1.4		Kuziy-Trybushany	1369,6	3163,4	1369,6	3163,4	1369,6	3163,4	1369,6	3163,4	3163,4
1.5		Maramorosh	2243,6	6230,4	2243,6	6230,4	2243,6	6230,4	2243,6	6230,4	6230,4
1.6		Stuzhytsia-Uzhok	2532,0	3615,0	2532,0	3615,0	2532,0	3615,0	2532,0	3615,0	3615,0
1.7		Synevyr – Darvaika						1588,46	312,32	1588,46	312,32
1.8		Synevyr – Kvasovets						561,62	333,63	561,62	333,63
1.9		Synevyr - Strymba						260,65	191,14	260,65	191,14
1.10		Synevyr – Vilshany						454,31	253,85	454,31	253,85
1.11		Zacharovanyi Krai - Irshavka						93,97		93,97	
1.12		Zacharovanyi Krai - Velykyi Dil						1164,16	1275,44	1164,16	1275,44
1.13		Gorgany						753,48	4637,59	753,48	4637,59
1.14		Roztochya						384,81	598,21	384,81	598,21
1.15		Satanivska Dacha						212,01	559,37	212,01	559,37

1	2	3	4	5	6	7	8	9	10	11
2.1	<b>Slovakia</b>	Havešová	171,3	63,99	171,3	63,99	171,3	63,99	167,88	6474,84
2.2		Stužica – Bukovské Vrchy	2950,0	11300,0	2950,0	11300,0	2950,0	11300,0	1742,47	5694,84
2.3		Rožok	67,1	41,4	67,1	41,4	67,1	41,4	74,37	1138,89
2.4		Vihorlat	2578,0	2413,0	2578,0	2413,0	2578,0	2413,0	1553,06	854,08
2.5		Udava							455,82	814,69
3.1	<b>Germany</b>	Jasmund			492,5	2510,5	492,5	2510,5	492,5	2510,5
3.2		Serrahn			268,1	2568,0	268,1	2568,0	268,1	2568,0
3.3		Grumsin			590,1	274,3	590,1	274,3	590,1	274,3
3.4		Hainich			1573,4	4085,4	1573,4	4085,4	1573,4	4085,4
3.5		Kellerwald			1467,1	4271,4	1467,1	4271,4	1467,1	4271,4
4.1	<b>Albania</b>	Lumi i gashit					1261,52	8977,48	1261,52	8977,48
4.2		Rrajca					2129,45	2569,75	2129,45	2569,75
5.1	<b>Austria</b>	Dürrenstein					1867,45	1545,05	1867,45	1545,05
5.2		Kalkalpen – Hintergebirge					2946,20	14197,24	2946,20	14197,24
5.3		Kalkalpen – Bodinggraben					890,89		890,89	
5.4		Kalkalpen – Urlach					264,82		264,82	
5.5		Kalkalpen – Wilder Graben					1149,75		1149,75	
6.1	<b>Belgium</b>	Sonian Forest – Forest Reserve “Joseph Zwaenepoel”					187,34		4650,86	
6.2		Sonian Forest – Grippensdelle A					24,11	24,11		
6.3		Sonian Forest – Grippensdelle B					37,38	37,38		
6.4		Sonian Forest – Réserve forestière du Ticton A					13,98	13,98		
6.5		Sonian Forest – Réserve forestière du Ticton B					6,50	6,50		



1	2	3	4	5	6	7	8	9	10	11
9.8	<b>c.d. / continued Italy</b>	Falascone (Foresta Umbra)					182,23	1752,54	254,30	3486,29
9.9		Pavari – Sfilzi							667,13	
9.10		Monte Cimino					57,54	87,96	57,54	87,96
9.11		Monte Raschio					73,73	54,75	73,73	54,75
9.12		Sasso Fratino					781,43	6936,64	781,43	6936,64
9.13		Valle Infernale							320,79	2191,36
10.1	<b>Romania</b>	Cheile Nerei – Beușnița					4292,27	5959,87	4292,27	5959,87
10.2		Codrul secular Șinca					338,24	445,76	338,24	445,76
10.3		Codrul Secular Slătoara					609,12	429,43	609,12	429,43
10.4		Cozia – Masivul Cozia					2285,86	2408,83	2285,86	2408,83
10.5		Cozia – Lotrisor					1103,30		1103,30	
10.6		Domogled – Valea Cernei – Domogled–Coronini–Bedina					5110,63	51461,28	5110,63	51461,28
10.7		Domogled – Valea Cernei – Iauna Craiovei					3517,36		3517,36	
10.8		Domogled – Valea Cernei – Ciucevele Cernei					1104,27		1104,27	
10.9		Groșii Țibleșului – Izvorul Șurii					210,55	563,57	210,55	563,57
10.10		Groșii Țibleșului – Preluci					135,82		135,82	
10.11		Izvoarele Nerei					4677,21	2494,83	4677,21	2494,83
10.12		Strîmbu Băiuț					598,14	713,09	598,14	713,09
11.1	<b>Slovenia</b>	Krokar					74,50	47,90	74,50	47,90
11.2		Snežnik – Ždrocle					720,24	128,80	720,24	128,80

1	2	3	4	5	6	7	8	9	10	11
12.1	<b>Spain</b>	Hayedos de Ayllón – Tejera Negra					255,52	13880,86	255,52	13880,86
12.2		Hayedos de Ayllón – Montejo					71,79		71,79	
12.3		Hayedos de Navarra – Lizarzoia					63,97	24494,52	63,97	24494,52
12.4		Hayedos de Navarra – Aztaparreta					171,06		171,06	
12.5		Hayedos de Picos de Europa – Cuesta Fría					213,65	14253,00	213,65	14253,00
12.6		Hayedos de Picos de Europa – Canal de Asotin					109,58		109,58	
13.1	<b>Bosnia and Herzegovina</b>	Prašuma Janj							295,04	380,74
14.1	<b>Czech Republic</b>	Jizera Mountains							444,81	2279,40
15.1	<b>France</b>	Chapitre							371,30	41,65
15.2		Grand Ventron							319,00	1328,00
15.3		Massane							239,50	1432,30
16.1	<b>Northern Macedonia</b>	Diaboka Reka							193,27	234,70
17.1	<b>Poland</b>	Border Ridge and Gorna Solinka valley							1506,05	24330,52
17.2		Polonina Wetlinska and Smerek							1178,03	
17.3		Terebowiec stream valley							201,00	
17.4		Wolosatka stream valley							586,66	
18.1	<b>Switzerland</b>	Forêt de la Bettlachstock							195,43	1094,16
18.2		Valli di Lodano, Busai and Soladino Forest Reserves							806,78	2330,74
<b>Total</b>			<b>29278,9</b>	<b>48692,69</b>	<b>33670,1</b>	<b>62402,29</b>	<b>92023,14</b>	<b>253815,38</b>	<b>98125,15</b>	<b>294720,87</b>

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