Bulgarian-Romanian Forest Mapping

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Project report 2009

The Bulgarian-Romanian Forest Mapping project is part of an initiative of the BirdLife European Forest Task Force for mapping Biologically Important Forests in Europe. The project was carried out in co-operation with the Bulgarian Society for the Protection of Birds and the Romanian Ornithological Society.

BULGARIAN-ROMANIAN FOREST MAPPING PROJECT

FINAL REPORT

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For more information on the forest mapping initiative:
www.forestmapping.net - interactive map of Biologically Important Forests with country reports
http://forest.birdlife.org – web page of the European BirdLife Forest Task Force
www.bspb.org – website of the Bulgarian Society for the Protection of Birds (BSPB)
www.sor.ro – website of the Romanian Ornitological Society (SOR)

ABBREVIATIONS

BIF	Biologically Important Forest
BRFM	Bulgarian-Romanian Forest Mapping
BSPB	Bulgarian Society for the Protection of Birds
EEA	European Environment Agency
EU	European Union
FTF	BirdLife European Forest Task Force
FSC	Forest Stewardship Council
GIS	Geographic Information System
HCVF	High Conservation Value Forest
HNV	High Nature Value
IBA	Important Bird Area
ICAS	Romanian Forest Research and Management Institute
IEEP	Institute for European Environmental Policy
IUCN	International Union for Conservation of Nature
MCPFE	Ministerial Conference on the Protection of Forests in Europe
NUTS	Nomenclature of Territorial Units for Statistics
SCI	Site of Community Imporatance
SFA	State Forestry Agency
SOR	Romanian Ornithological Society
UNEP	United Nation Environment Programme
WCMC	World Conservation Monitoring Centre
WSFI	Wildlife and Sustainable Farming Initiative
WWF DCP	WWF Danube-Carphatian Programme

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SUMMARY

The Bulgarian-Romanian Forest Mapping project (BRFM, 2007-2009) was the third stage of Birdlife's European Forest Task Force initiative of mapping BIFs across Europe. A Biologically Important Forest is defined as retaining features of natural forests or having started to develop such features. They each are considered a key area for the protection of forest-dependent species which require a certain quantity and quality of suitable habitat to maintain vital populations. BIFs were first mapped in Estonia, Latvia and Lithuania (2001-2003), followed by a mapping project in Poland and Belarus (2005-2007). The overall objective of the BIF mapping projects is to provide a basis for efficient protection and management of European forest ecosystems.

The specific goals of the BRFM project were to locate BIF's in Bulgaria and Romania, review their current protection status and propose concrete measures for management of the most important and valuable forests. Main sources of data for the project were the national forest inventory databases and digital and geo-referenced maps of forest stands. These sources were supplemented by other spatial databases and descriptive information such as data on the Natura 2000 network, protected areas maps, satellite images, scientific publications and others.

The biological importance of forests was assessed on the general BIF ecological criteria, adapted nationally in Bulgaria and Romania in order to match local conditions. Nine BIF criteria in Bulgaria and eight in Romania were used to identify BIF areas from the available databases.

The total area of forests fulfilling at least one of the BIF criteria covers about 23% of total forest cover in both countries. The majority of BIFs are located in mountainous areas inside protected areas. In both countries buffer zones of nature reserves and national parks and seed production stands contain many BIFs. The south-western and south-eastern parts of Bulgaria hold the most BIFs, and the most BIF rich regions in Romania are the south-western part of the country and the Danube Delta. The most commonly met BIF selection criterion in Bulgaria is Endangered forest ecosystems and habitats, and Forests with no or limited human activities in Romania (72% and 53% of all BIFs in each country, respectively). The most common BIF types in Bulgaria are Thermophilous deciduous forests and Montane beech forest. About 54% of BIFs belong to these two types, reflecting the dominance of deciduous forests in Bulgaria. The most common BIF types in Romania are Mesophile forests of mixed beech and coniferous species, Mesophile forest of beech in mountain areas and Meadow forests of alders, poplars, willows, ash and oaks, together amounting to more than the half of all identified BIFs.

Only 15% of Bulgarian and 8% of Romanian BIFs are strictly protected, while approximately 75% of such forests in both countries are absent any protection measures at all. Although most of BIFs are covered by the Natura 2000 network (70% of BIFs in Bulgaria and more than a half of BIFs in Romania), with no operating protection plans they are subject to unconstrained forest management and exploitation.

The BRFM project adds a new ecological aspect to the forest inventory databases in Bulgaria and Romania, which only focused on economic forest use. Depiction of BIF distribution in both countries helps decision makers understand the need for the rational planning and management of forests which takes the needs of biodiversity into account.

The BRFM maps are accessible through user-friendly online service at www.forestmapping.net.

The BRFM project was coordinated by the BirdLife International partners in Bulgaria and Romania: the Bulgarian Society for Protection of Birds and the Romanian Ornithological Society. This project was financially supported by the Aage V. Jensen Charity Foundation, which is gratefully acknowledged.

I. INTRODUCTION

1.1. European forests: A need for better protection

Forests are considered the most complex terrestrial ecosystems and play a crucial role in sustaining Europe's biodiversity. Natural forests are characterised by a higher level of biodiversity, in terms of their genetic resources, species and habitat diversity, than any other terrestrial ecosystem. Such forests are also among the most threatened biomes. Although the absolute area of European forests is expanding, the environmental quality of the forest ecosystems is in decline (WSFI, 2007). The changes that forests have undergone over the past few centuries: degradation and disappearance of natural characteristics, have caused serious losses in forest biodiversity and brought a great number of specialized species to the verge of extinction.

As European forests are managed and protected according to different national and regional legislation and standards, assessment of actual protection at the European level is very difficult. There are more than 90 categories of protected forest areas in Europe (EEA, 2008). Two international classification systems are widely used - the IUCN's "Protected Area Management Categories" and "Protected and Protective Forest and Other Wooded Land in Europe" of the MCPFE. 6.3% of European forests belong to the IUCN categories I-IV (UNEP/WCMC, 2000). However, the total area of strictly protected forests, corresponding to categories I and II, comprises merely 1.7% of the total forest area (Parviainen et al., 2000). The most recent data from the MCPFE report on Sustainable Forest Management in Europe - "State of Europe's Forests 2007", stated that 4.4% of the forests in Europe (excluding the Russian Federation) have minimal or no intervention, and further 3.8% have active management. However, it is not clear if "minimum intervention" meets the standards of categories I and II or, rather IV and V (active protection and landscape protection, respectively).

The EU programme for analysis and harmonization of protected forest areas in Europe, COST E-27[1], has not to date provided any definitive data on how much of European forests are protected specifically for the purpose of biodiversity conservation (EU COST Action E27, 2007). As yet, all attempts at such generalization on the European level have been based on statements by particular countries' representatives, referring to vague concepts (e.g. protected areas, sustainable management), rather than on an independent assessment based on measurable indicators.

The establishment of the Natura 2000 network has substantially increased the area of protected forests in Europe. "In some countries Natura 2000 sites coincide with national protection categories (national parks, reserves, etc.). However, in many countries, Natura 2000-status does not impose a primary management objective for protection or protective forest, but allows the continuation of multifunctional and economic management, as long as it does not contravene the conservation objectives set out in the Birds and Habitats Directives" (EU COST Action E27, 2007). Since every Natura 2000 site management regime is decided separately, presently we cannot assess which parts of the forests within Natura 2000 are managed without or with minimum human intervention, and which are under active management.

"Hands-off" management is the most efficient approach for the preservation of pristine forests, as their habitats and biodiversity are dependent on the dynamics of natural processes. Unfortunately, the existing network of Europe's protected areas does not ensure such protection, with 95% of protected areas smaller than 1,000 ha (UNEP/WCMC, 2000). Additionally, as most of the largest forest reserves are located in the marginal lands of the far North or high mountains, lowland forests are underrepresented in the protected area system.

In the increasingly fragmented European landscape, the resilience of forest ecosystems and the effectiveness of protected areas are jeopardised by inconsistent management and spatial layout without regard to species' dispersal and migratory requirements. Therefore, any further conservation efforts should involve a holistic approach adapting the management of land outside existing protected areas to the ultimate goal of the restoration and efficient conservation of functioning landscapes. The preservation of all remnants of natural forests and restoration of the ecological connectivity among forest biodiversity hotspots are the most urgent conservation priorities in the face of major trends, including intensification of forest management, ecological fragmentation and urban sprawl as well as climate change.

1 See chapter VI. Glossary

1.2. What will make forest biodiversity conservation successful?

The basic pre-condition for successful and cost effective biodiversity conservation is the identification and cataloguing of forest areas which have retained substantially more of the characteristics of natural forests than those "average" European forests intensively managed through active silviculture. These forest areas include both remnants of natural, undisturbed forest ecosystems and partially disturbed habitats with high restoration potential. Such knowledge is necessary to identify gaps in the existing protected area network and to optimize forest policy in the context of current and predicted major trends.
The conservation of forest biodiversity needs to be undertaken at two levels in order to be successful:

- preservation of elements and sites of high natural value (dead wood, over-aged trees, strict nature reserves) (WSFI, 2007) and creation of a functional and representative network of forest protected areas;
- integration of biodiversity-friendly practices into widespread forestry practices (WSFI, 2007).

In this way, the connectivity between core areas (forest biodiversity hotspots) representing all types of European forest ecosystems will be ensured, and commercial forest management will favour natural regeneration and the continuity of natural processes that shape forests' structure.

1.3. BirdLife's Biologically Important Forest concept – A step toward habitat matrix preservation

Despite a number of ongoing initiatives, the systematic and harmonized Europe-wide ecological monitoring and assessment of forests is not available (EEA, 2008). One of the action points in the EU Biodiversity Action plan is the identification of High Nature Value (HNV) forests. As yet, however, no systematic approach has been developed to meet that objective (IEEP et al., 2007). As an analogue to the definition of HNV farmland and HNV features, HNV forests can be defined as all forests in Europe which are natural and undisturbed, in semi-natural states where management (historical or present) supports a high diversity of native species and habitats and/or which support the presence of species of European, national, or regional conservation concern (IEEP et al., 2007).

The concept of High Conservation Value Forests [2] (HCVF) was developed by the Forest Stewardship Council in 1999 and the HCV forests were defined as "forests of outstanding and critical importance due to their high environmental, socio-economic, biodiversity or landscape values".

A Biologically Important Forest is a concept proposed by the BirdLife's European Forest Task Force, in order to identify and map Europe's forest areas of High Nature Value. The precise location of such forests will provide the foundation for efficient protection and management of European forest ecosystems.

A Biologically Important Forest is a forest that has remained in a natural or close to natural state, which is considered a key area for the protection of forest-dependent species that need a certain amount and quality of suitable habitat to survive and maintain vital populations. A BIF may be part of the existing protected area network designated by national legislation (forests in nature reserves, zones of strict protection in national parks, scientific reserves, etc.) or may lie outside protected areas. The term BIF is a "basket" for the existing designations that refer to forests of HNV or with important ecological functions.

2 See chapter VI. Glossary



1.4. Mapping Biologically Important Forests in Europe

The overall objective of the BIF mapping projects in Europe is to provide a basis for the efficient protection and management of European forest ecosystems. The biological importance of forests is assessed on the general BIF ecological criteria, adapted nationally in each country that is participating in mapping in order to match local conditions. Each BIF selected must meet at least one criterion; a forest which meets more than one criterion is of greater significance and has greater value for biodiversity. The most important data source for BIF mapping projects are national forest inventory databases and digital maps of forest stands, supplemented by other source such as topographic maps, maps of protected areas (including Natura 2000 sites), data on forest dependent bird species, National Red Lists, CORINE Land Cover, scientific publications, satellite imagery, etc. Field investigations are conducted to verify the accuracy of the preliminary map with BIF distribution.

The BIFs mapped to date have been uploaded to a GIS database accessible through an interactive and user-friendly on-line service at **www.forestmapping.net.**

The BIF approach provides a new ecological dimension to the existing forest inventory database which is primarily used for economic purposes. By depicting BIF distribution and providing their basic statistics, the mapping service helps make clear the need for rational planning and forest management on landscape, regional and European scales. BIF maps have the potential to be a very strong communication tool, contributing to the understanding of the importance of HNV forests in the landscape on the part of decision makers and the general public.

1.5. Bulgarian-Romanian Forest Mapping project as a BIF mapping module

Mapping of BIFs was first accomplished in Estonia, Latvia and Lithuania (Baltic Forest Mapping - BFM, 2001-2003), followed by Poland and Belarus (Belarusian-Polish Mapping - BPFM, 2005-2007). The Bulgarian-Romanian Forest Mapping (BRFM, 2007-2009) was the third stage of Birdlife's initiative.

Forests cover 34% and 27% of the country area of Bulgaria and Romania respectively. They are among Europe's richest and most diverse ecosystems. The physiographic characteristics of the countries, a derivative of their climatic conditions, topography and hydrology, has produced a great variety of forest habitat types. Additionally, the habitats are very rich in endemic plant and animal species. Most of the forests in Bulgaria and Romanian are located in the mountainous and semi-mountainous areas. Vast, unfragmented primeval forests remain in the Carpathians, the Balkan, Rila and Pirin mountains, and there are some almost untouched forests in isolated areas of the Danube Delta. These forests provide shelter for many rare and threatened species and harbour a significant proportion of Europe's large carnivore populations such as brown bears, wolves and lynx.

Forestry in both countries is still aimed at ensuring optimal economic gains from sylviculture. Some of the challenges to sustainable use of forest resources are linked with illegal activities, increased human activities in forests and inefficient forest biodiversity policy implementation. Forests in Romania are facing a serious challenge in the immediate future as approximately 30% of them have been designated to be returned to more than half a million private owners without adequate legal safeguards.

Forest management plans in Bulgaria and Romania are not designed to take account of the non-economic dimensions of forests. The main parameters important for biodiversity, such as forest type, deadwood quantity and quality, presence of rare and endangered species, are still not taken into account in the national forest inventory. Biodiversity conservation has not yet been able to make its way into the mainstream of forest management. Most of currently applied forest management practices, like regeneration fellings and thinings, have so far lead to the formation of even-aged stands with a uniform structure. The implementation of selection systems, which promote the formation of multi-aged stands, are not commonly practiced (Yonov&Velichkov, 2004). At the same time, forest management in both countries is alleged to have become more environmentally friendly as a result of the countries' participation in the process of the Ministerial Conference on the Protection of Forests in Europe and their commitments to related international treaties and agreements. In this contradictory situation, the distribution of existing forests with HNV needs to be assessed. This is the first step towards their effective conservation by means of appropriate protection, management, and preservation. The goal of the BRFM project was to locate Biologically Important Forests in Bulgaria and Romania, review their current protection status and propose concrete measures for management of the most important and valuable forests.

II. BULGARIAN - ROMANIAN FOREST MAPPING PROJECT METHODOLOGY

2.1. Project management

The Bulgarian-Romanian Forest Mapping project was coordinated by the BirdLife partners in Bulgaria and Romania: the Bulgarian Society for Protection of Birds and the Romanian Ornithological Society. In Romania the project was implemented with cooperation of the Forest Research and Management Institute.

The Bulgarian and Romanian modules of the project were carried out by the National Project Officers in both participating countries and supervised by an overall project co-ordinator. The work was overseen by a Steering Committee with a member from each project partner organisation and the BirdLife European Forest Task Force. Methodological aspects of the project (e.g. defining and interpretation of criteria of selecting BIFs) were based on the consultation of and consensus among with independent forest ecology experts in each project country.

2.2. Material and methods

2.2.1. List of BIF criteria

The criteria for the selection of biologically important forests areas are defined on purely ecological bases. The general BIF criteria, used first in the Baltic Forest Mapping (Kurlavicius et al. 2004) were as follows:

1. **Little or no signs of human influence**
2. **Average age of stand more than X years**
3. **Uneven age/canopy structure; presence of very old trees of previous tree generations**
4. **Considerable amount / long continuum of dead wood of different types, rich flora of wood rotting fungi**
5. **Large blocks of unfragmented forests**
6. **Forests on steep slopes**
7. **Endangered vegetation types**
8. **Rare forest-dependent species present**
9. **Rare broadleaved tree species present in the dominating canopy layer**
10. **Forests after large-scale natural disturbance and natural regeneration**
11. **Small water courses; surface springs, flooded areas**
12. **Limited access areas**

2.2.2. Methodological justification of the selection criteria

Little or no signs of human influence
Large blocks of unfragmented forests
Limited access areas
Small water courses, surface springs, flooded areas

Forests meeting the criterion Little or no signs of human influence are by definition ecosystems that have developed naturally and preserved the continuum of the natural processes that shape their dynamics (BPFM report, 2005). Such forests are extremely rare in Bulgaria, Romania and Europe as a whole. Outside protected areas, a high degree of naturalness is likely to be preserved mainly in hard-to-access areas, e.g forests in the least accessible parts of mountains, wooded islands on lakes and rivers and forests in periodically flooded areas (BPFM report, 2005).

According to the EEA report in 2008, "Significant areas of old undisturbed forests occur as scattered relicts in the mountain areas of the Alpine, Balkan and Carpathian regions." This is also the case on the Danube islands and delta. Such forest stands often have an uneven spatial structure, are rich in deadwood at various stages of decomposition and have other features typical of primeval, old growth forests. Forests in flooded areas (floodplain forests in valleys of large rivers) often play the role of ecological corridors for many animals, offering refuge for various bird species. Both mountain and lowland BIFs provide numerous indispensable ecological services, including erosion and avalanche control, food security, water supply and filtering, recreation, etc.

Photo 1: Caraorman forest in the Danube Delta, Little or no signs of human influence and limited access areas, V. Ferdinandova

Average age of stands more than X years, where X is at least 20 years more than the commercial maturity species specific age

Considerable amount/long continuum of dead wood

Because of intensive forest management, only a limited number of old-growth forests are left in Bulgaria, Romania and most of Europe. Such remnants of primeval forests are extremely important for biodiversity conservation (Hanski and Walsh 2004, Gilg 2005). Some of them have preserved numerous old-growth characteristics (including a considerable amount of decaying wood), whereas for others the major asset is large numbers of old "veteran" trees. Such trees, as well as decaying wood, are the most important providers of microhabitats critical for the preservation of forest-specific biodiversity. For 30 - 50% of species of forest flora and fauna the survival of stable populations depends on an adequate quantity of dead wood in various phases of decay (Angelstam et al. 2003). A large number of species are found only in late succession stage forests (EEA report, 2008). In natural forests in Romania, deadwood is associated with several relict, rare and protected animal species including saproxylic insects such as *Rhysodes sulcatus, R. americanus, Cerambyx cerdo, Lucanus cervus, Rosalia alpina, Camponotus herculeanus* (Radu, 2007). Many other rare and protected insect species inhabit old and decaying trees (Radu, 2007).

Uneven age /canopy structure

Presence of very old /mature trees from previous tree generations

The presence of trees with exceptional age and size in combination with trees at different stages of stand development and forest succession is a typical characteristic of virgin forests (Raev et.al., 2003). The maximum age differs depending on the individual species' longevity and local environmental conditions. In natural conditions, uneven canopy structure results from the dynamics of growth, development and death of trees of various species, often subject to natural disturbances caused by strong winds, fire, insect outbreaks, fungal infections, activity of beavers etc. A horizontally and vertically diversified canopy structure multiplies a forest's capacity to harbour forest species of different habitat requirements, including large birds of prey and various hole-nesting birds.

Photo 2: Considerable amount and long continuum of dead wood, D. Kostovska

Photo 3: Presence of very old trees from previous tree generations, D. Parvanova

Forests on steep slopes and ravines

Forests on slopes often protect the soil from erosion. Thanks to specific hydrological conditions and exposure, they frequently house microhabitats of rare plant species as well as unique vegetation types. On steep slopes, forests often preserve a higher degree of naturalness thanks to limited access and less intensive logging. The majority of the virgin forests in Bulgaria have emerged and survived on steep, very steep and ravine terrains. Apparently, this inaccessibility has been and is the primary factor for their preservation, preventing commercial exploitation (Raev&Veeen, 2005). Remnants of the large virgin forests in Romania have escaped cutting and other direct human impacts because of their location in "inaccessible hydrographic basins" – steep terrain in which there is a lack of roads (Radu, 2007).

Photo 4: Forests on steep slopes in Pietrosu Mountain, Romania, WWF DCP Romania arhive

Forests after large-scale natural disturbance and natural regeneration

Disturbances in natural forests may occur at various intensities as well as at a variety of spatial and temporal scales; for example a wind storm may result in single uprooted tree, in larger gaps created by the fall of entire clusters, or in vast, massive stand destruction referred to as a "calamity"(Bobiec at al, 2005). Large natural disturbances create natural gaps in the canopy and increase the amount of dead wood nurturing much of the forest biodiversity, including numerous saproxylic species of fungi, lichens and insects as well as many birds and other vertebrate species. Most of these species are either absent or much less abundant in managed forests (Parminter and Daigle 1997, Szwagrzyk, 2000). If left on its own, a stand's recovery processes after disturbances are the basic mechanisms of adaptation to a changing environment and help develop a close-to-nature structure.

Photo 5: Rare forest dependant species present, L. Bereczky

Photo 6: Endangered forest vegetation type - Western Pontic *Fagus* forests, D. Kostovska

Endangered vegetation types

Rare or endangered forest-dependent species present

Occurrence of rare forest-dependent species and endangered vegetation types is a great asset to the biological value of forests. Many rare and endangered forest-dependent species survive only in protected areas or naturally occur in small ranges. Many of them are indicator species whose presence attests to the high quality of the habitat and its potentially high conservation value (Johnsson 1993, Uliczka and Angelstam 2000, Mikusinski et al. 2001). Some ecosystems are naturally rare, where the climatic or geological conditions necessary for their development are limited in extent. Other ecosystems have become rare through human activities, such as land use, conversion for agriculture or urban development.

Rare broadleaved/coniferous species present in the dominant canopy layer

In many broadleaved and coniferous forests, the species associated with a given site's natural conditions have been substituted by species of a higher economic value. For this reason, there is a deep deficit of many tree species considered important components of natural vegetation, including *Tilia, Ulmus, Taxus, Juniperus* and wild fruit trees. This is why forests retaining a considerable proportion of such species should be classified as BIFs.

2.2.3. Adaptation of the general BIF criteria to the peculiarities of the Bulgarian and Romanian forests

The general BIF criteria were individually adapted to conditions specific to Bulgaria and Romania. Proper selection and adaptation of BIF criteria was achieved through consultation with local forest ecology experts. Nine criteria for identification of BRFM forests in Bulgaria were applied and eight criteria were applied in Romania. Stands were selected for the BRFM database according to the defined criteria. A particular stand may be included on the basis of one or more selection criteria.

According to the consulted local experts, the criterion Forests after large-scale natural disturbance and natural regeneration is not applicable to the Bulgarian and Romanian conditions. According to them, the dynamics of temperate forests are shaped by small scale, rather than large scale disturbances. Additionally, the forest management practices in both countries require removal of fallen and dead trees in the disturbed stands and immediate obligatory reforestation.

Although large unfragmented forest areas of up to 3,400 km^2 are found in Romania (EEA, 2002), the data available did not allow identification of the criterion Large blocks of unfragmented forests in either country. The estimation of the minimum size of unfragmented forest blocks necessary to perpetuate forest ecosystem functions and sustain vital populations of forest specialized species will require extensive further research in the region covered by the project in order to be mapped properly.

The criterion Rare forest-dependent species present was divided into two new criteria – Presence of forest-dependent species with high conservation significance and Critical concentration of species. The first criterion encompasses forests inhabited by rare and endangered species, as well as forests with natural characteristics creating potential to become such habitats. The aim of the second criterion is to identify forests on which an important concentration of species depends on them at least during certain phases of their life cycle.

The BRFM criteria actually applied in both countries:

	General BIF criteria	**Criteria applied in Bulgaria**	**Criteria applied in Romania**
1	Little or no signs of human influence	Forests with no or limited human activities	
2	Average age of stand more than X years	Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age	Old growth forest with two indicators: Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age and Old growth forest with multi layer and multi age structure
3	Uneven age/canopy structure; presence of very old trees of previous tree generations	Forests with close to nature spatial structure	
4	Considerable amount / long continuum of dead wood of different types, rich flora of wood rotting fungi	Considerable amount/long term continuum of dead wood	
5	Large blocks of unfragmented forests	Insufficient data	
6	Forests on steep slopes	Not applicable	Forests on slope > 35 degrees is one of the indicator of Criterion 1
7	Endangered vegetation types	Endangered forest ecosystems and habitats	
8	Rare forest-dependent species present	Forests that are habitats of endangered, rare and endemic forest dependent species of plants and animals	
		Critical concentration of species	
9	Rare broadleaved tree species present in the dominating canopy layer	Forests where rare broadleaved and coniferous species are present	
10	Forests after large-scale natural disturbance and natural regeneration	Not applicable	
11	Small water courses; surface springs, flooded areas	Functional type forests with three indicators: Island forests in the lowlands Forest belts along roads and agricultural lands Forests on wooded islands and floodplain forests along the banks of rivers	Forests within floodplains, forest islands, specific forests on bogs
12	Limited access areas		

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The criterion Forests on steep slopes was not applicable to Bulgaria. Steepness of slopes is not enough to limit forestry activities in the country. Clear cuttings are carried out even on slopes greater than 30 degrees.

The criterion Limited access areas covers mainly forested islands along the Danube in Bulgaria and therefore it was considered together with the criterion Functional type forests.

Detailed definitions of Bulgarian BIF criteria and indicators:

Criterion 1: Forests with no or limited human activities

The criterion is combination of the following indicators:
- I1: Forests in reserves;
- I2: Forests in the strict protected areas of the national and nature parks;
- I3: Virgin forests - in accordance with the research conducted by the Bulgarian Forest Research Institute and the Royal Dutch Society for Nature Conservation (Inventory and strategy for sustainable management and protection of virgin forests in Bulgaria);
- I4: Closed basins and inaccessible forests ("closed basins" are situated on hard-to-access localities, in the vicinity to the state frontier or on very steep terrains);
- I5: Forests in a 200 m zones of the upper limit of the forest according to the Forest Act;
- I6: Forests within protective areas of drinking water sources (watershed areas).

Criterion 2: Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age

The criterion was developed independently for each of the most common tree species in Bulgaria using their final maturity age, longevity and the characteristics of site quality classes.

Table 1: Reference values for identifying old forests according to the main tree species, harvesting age and site quality class

Tree species	Age in accordance with the site quality class				
	I	II	III	IV	V
Scots pine *Pinus silvestris* L.	140	140	120	120	120
Black pine *Pinus nigra* Arn.	140	140	120	120	120
Norway spruce *Picea abies* (L.) Karst.	140	140	120	120	120
Silver fir *Abies alba* Mill.	140	140	120	120	120
Macedonian pine *Pinus peuce* Griseb. and Bosnian pine *Pinus heldreichii* Christ.	160	160	160	160	160
Beech *Fagus silvatica* L. and Oriental beech *Fagus orientalis* L.	160	160	140	120	120
Downy oak *Quercus pubescens Willd.* s.l. and Turkey oak *Quercus cerris* L.	120	120	120	120	120
Other oak species Quercus sp.	160	160	140	140	140
Hornbeam *Carpinus betulus* L.	120	120	120	120	120
Maples *Acer* sp.	120	120	120	120	120
Chesnutt *Castanea sativa* Miller and Common walnut *Juglans regia* L.	120	120	120	120	120
Other tree species (*Tilia sp., Fraxinus sp., Ulmus sp., Alnus sp., Populus sp.*and others)	100	100	100	100	100

Criterion 3: Considerable amount/long term continuum of dead wood

Due to lack of data about this in the national forest database, this criterion was not mapped in Bulgaria.

Criterion 4: Forests with close to nature spatial structure

The criterion is a combination of several indicators, some of which are different among the most common tree species in Bulgaria.
- I1: Natural origin;
- I2: Stocking rate of the main canopy layer >= 5;
- I3: Age of the main canopy layer – coniferous species >90 years; deciduous species – Downy oak, Hornbeam, Lime >60 years; Turkey oak, Sessile oak, Hungarian oak, ash, Pedunculate oak, Beech > 100 years;
- I4: Uneven vertical and horizontal spatial structure;
- I5: Presence of second layer with stocking rate more than >2 and age at least 20 years less than the age of the main canopy layer.

This criterion includes also stands where very old trees from previous generations are present.

Criterion 5: Endangered forest ecosystems and habitats

In order to identify the forests that correspond with this criterion, we applied the list of the Forest areas that are in, or contain rare, threatened or endangered ecosystems from the National Toolkit for Identifying High Conservation Value Forests (Annex 2). This list has been updated and expanded with all forest habitats listed in Annex 1 of the Biodiversity Act (Bulgarian Natura 2000 habitats according to the Habitat Directive) along with six additional endangered forest habitats listed as endangered habitats in the Red Book of Habitat Types in Bulgaria (2008).

Special attention has been paid to the following forest types:
- Floodplain forests (forests along large rivers such as Danube, Tundza, Maritza as well as on Danube islands). Flooding duration has a strong influence on the vegetation character, in particular with regard to the species composition of the herbaceous layer (Strategy for the Protection and Restoration of Floodplain Forests on the Bulgarian Danube Islands, 2001);
- Mire and swamp forests;
- Riparian forests (forests adjacent to a body of water such as rivers, streams, lakes).

Criterion 6: Presence of forest-dependent species with high conservation significance

The National Toolkit for Identifying HCVF was used in order to identify forests that are indicators for high conservation signifacamce according to the list of the Threatened, endangered and endemic species in Bulgaria (for more information www. forestmapping.net, Bulgarian national report, Annex 2).

Criterion 7: Critical concentration of species

The criterion consists of two indicators:
- I1: Indicator species with minimal concentrations in Bulgaria according to the list in the National Toolkit for identifying HCVF. If there is a constant or seasonal concentration of indicator species in a forest or the forest is a habitat with critical importance according to the requirements in the list, then the forest is considered biologically important; (for more information: www.forestmapping.net, Bulgarian national report, Annex 3)
- I2: All other already identified BIFs in accordance with other criteria when they are situated within Important Bird Areas, Important Plant Areas, Prime Butterfly Areas[3] and others.

3 See chapter VI. Glossary

Criterion 8: Forests where rare broadleaved/coniferous tree or shrub species are present

According to this criterion, BIFs are these forests which species composition includes one or more of the deciduous / coniferous tree or shrub species listed below:
Bulgarian fir, King Boris fir (*Abies borisii-regis*)
Sweet chestnut (*Castanea sativa* Mill.)
Greek maple (*Acer heldreichii* Orph.)
Oriental plane (*Platanus orientalis* L.)
Red-twigged lime (*Tilia rubra* DC.)
Pyrus elaeagrifolia Pall. subsp. bulgarica
Service tree (*Sorbus domestica* L.)
Wild cherry (*Prunus avium* L.)
Quercus hartwissiana Steven
Quercus mestensis Bondev et Gan ev
Quercus protoroburoides
Turkish Hazel (*Corylus colurna* L.)
Kermes Oak (*Quercus coccifera* L.)
Yew (*Taxus baccata* L.)
Caucasian Hackberry (*Celtis caucasica Willd.*)
Pontic Rhododendron (*Rhododendron ponticum* L.)
Cherry laurel (*Laurocerasus officinalis* M. J. Roemer)
European Holly (*Ilex aquifolia* L.)
Black Sea holly (*Ilex colchica* Poj.)
Greek Juniper (*Juniperus excelsa* Bieb.)
Vaccinium arctostaphyllos L.
Russian Peashrub (*Caragana frutex* (L.) Koch)
Chamaecytisus danubialis L.
Chamaecytisus frivaldszkyanus (Degen) Kuzmanov
Chamaecytisus neiceffii (Urum.) Rothm.
Clematis alpina (L.) Mill
Hyppophae rhamnoides L.

Criterion 9: Functional type forests

The criterion is combination of the following indicators:
- I1: Lowland forests – isolated forests islands surrounded by agricultural lands;
- I2: Forest belts along roads and agricultural lands;
- I3: Forests on wooded islands and floodplain forests along the banks of rivers.

ROMANIA

The criteria Small water courses; surface springs, flooded areas and Limited access areas were combined in one criterion Forests within floodplains, forest islands, specific forests on bogs.

Detailed definitions of Romanian BIF criteria and indicators:

Criterion 1: Forests with no or limited human activities

The criterion is combination of the following indicators:
- I1: Forests in nature reserves;
- I2: Forests in the strict protected areas of the national and nature parks;
- I3: Virgin forests – as identified by the Forest Research and Management Institute (Inventory and strategy for sustainable management and protection of virgin forests in Romania);
- I4: Forests on slopes>35 degrees.

Criterion 2: Old growth forest

In this category we have forests which have remained unexploited over a long time period, and which exceed a specific age of stand determined separately for each species. Due to increased logging, few forests still fulfill this criterion in Romania.
The criterion is a combination of the following indicators:
- I1: Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age (Tab. 2);
- I2: Old growth forest with multi layer and multi age structure (there is a specific info in forest inventory database for such a criterion).

Table 2: Reference values for identifying old forests according to the main tree species, commercial maturity age

Tree species	**Age**
Scots pine *Pinus silvestris* L.	120
Norway spruce *Picea abies* (L.) Karst.	120
Silver fir *Abies alba* Mill.	120
Beech *Fagus silvatica* L.	120
Downy oak *Quercus pubescens* Willd. s.l. and Turkey oak *Quercus cerris* L., Other oak species *Quercus sp.*	140
Hornbeam *Carpinus betulus* L.	100
Maples *Acer* sp.	100
Other broadleaf tree species (*Tilia sp., Fraxinus sp., Ulmus sp., Alnus sp., Populus sp.*and others)	100

Criterion 3: Considerable amount/long term continuum of dead wood

This criterion was not mapped due to lack of nationwide information.

Criterion 4: Endangered forest ecosystems

In order to identify the forests that correspond to this criterion, data from the ongoing LIFE+ project "Alpine, subalpine and forests priority habitats in Romania" (2005 - 2009) were used as well as data from the national forestry database, mapped for Criterion 2. In order to standardize different forest classification systems the book "Romania's Habitats" (Donitsa et al., 2005) was referred to:
91DO* - *Bog woodland*, with equivalent Romanian classification system:
R3106 Sphagnetum mountain pine scrub
R4412 Birch and conifer mire woods
R4414 Sphagnum birch woods

91E0* - *Alluvial forest with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*, with equivalent Romanian classification system:
R4401 Eastern Carpathian grey alder galleries
R4402 Pre-Carpathian stream ash – alder woods

91I0* - *Euro-Siberian steppic woods with Quercus spp*, with equivalent Romanian classification system:
R4138 Dacian tatar maple oak-hornbeam forest
R4142 Getic-pre-Carpathic *Corylus colurna* - Sessile oak forest
R4146 Sarmatic Acer tataricum - *Quercus robur steppe* woods
R4148 Pannonic sand steppe oak woods
R4156 Pontic Acer tataricum - *Q. pedunculiflora - Q. cerris steppe* woods
R4157 Pontic A. tataricum – *Q. pedunculiflora steppe* woods
R4159 Danubian *Q. pedunculiflora - Q. robur steppe* woods

Criterion 5: Critical concentrations of species

For this criterion several different databases were used, such as SOR's database of the distribution of the nests of birds of prey and water bird colonies (forest nesting species). Data on distribution of Capercaillie leks and brown bears from the forestry database were used as well. Any other already identified BIFs (under other criteria) were considered to meet the Critical concentration of species if situated in the national network of Important Bird Areas (detailed information on web page http://iba.sor.ro/index.htm).

Criterion 6: Forests that are habitats of endangered, rare and endemic forest dependent species of plants and animals

This criterion was not mapped due to lack of nationwide information.

Criterion 7: Forests where rare broadleaved and coniferous species are present

Biologically Important Forests qualifying under this criterion have a species composition including one or more of the deciduous or coniferous tree species listed below:
- European Yew *(Taxus baccata* L.*)*
- Black pine *(Pinus nigra banatica)*
- Swiss pine *(Pinus cembra* L.*)*
- Wild pear *(Pyrus pyraster* (L.) Burgsd.*)*
- Wild cherry *(Prunus avium* L.*)*
- Turkish Hazel *(Corylus colurna* L.*)*
- Wild service tree *(Sorbus torminalis* L.*)*

Criterion 8: Forests within floodplains, forest islands, specific forests on bogs

Floodplain forests included in this category are among the most reduced Romanian forest types, due to intense exploitation in the last 200 years. They were severely fragmented and in some regions they have been completely converted to agricultural land. For their identification we referred to the data from the ongoing LIFE+ project "Alpine, subalpine and forests priority habitats in Romania" (2005 – 2009, LIFE+05 NAT/RO/000176). The book "Romania's Habitats" (Donitsa et al., 2005) was referenced in order to standardize different forest classification systems:
91DO* - *Bog woodland*, with equivalent Romanian classification system:
R3106 Sphagnetum mountain pine scrub
R4412 Birch and conifer mire woods
R4414 Sphagnum birch woods

91E0* - Alluvial forest with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*, with equivalent Romanian classification system:
R4401 Eastern Carpathian grey alder galleries
R4402 Pre-Carpathian stream ash – alder woods

91F0 - Riparian mixed forests of *Quercus robur, Ulmus laevis, U. minor, Fraxinus excelsior or F. angustifolia along the great rivers (Ulmenion minoris)*, with equivalent Romanian classification system:
R4404 South-east European ash-oak-alder forest

92A0 - *Salix alba and Populus alba* galleries, with equivalent:
R4405 Western Pontic white – black poplar galleries
R4406 Western Pontic white poplar galleries
R4407 Pontic willow galleries
R4408 Lower Danube willow galleries
R4409 Western Pontic *Fraxinus pallisae* woods
R4410 Danube Delta *Periploca poplar-oak-ash* galleries
R4411 Danube Delta *Periploca poplar-oak-ash-alder* galleries

2.2.4. Source of data and analysis

The BRFM database and maps are primarily based on the national forest inventory database from Bulgaria and Romania and related digital and geo-referenced maps of forest stands. Forest management planning practice in both countries is currently directed mainly towards the production and management of timber resources. The main parameters related to biodiversity conservation, such as forest type, area, situation and connection of the habitats are not yet taken into consideration, therefore these sources were supplemented by other available spatial databases and descriptive information such as:
- data on the Natura 2000 network site identification and proposals database;
- database of the Virgin Forests Inventory Projects carried out in both countries;
- protected areas maps and management plans;
- Bulgarian and Romanian Important Bird Areas database;
- database of Important Plant Areas and Prime Butterfly Areas in Bulgaria;
- data of pilot projects identifying HCVF used for FSC forest certification in both countries;
- information on the ranges of Capercaillie and brown bear in Bulgaria and Romania;
- satellite images;
- scientific publications;
- CORINE Land Cover.

BULGARIA

The main source of information was the forest inventory database. The database is updated every ten years. Forest management planning in Bulgaria is carried out on the level of individual stands, management classes, and ownership categories. All forests and forested land must be included in the inventory, irrespective of their ownership status. The area of forests and forested land is divided into compartments and subcompartments. Boundaries of compartments are discernible natural field lines such as rivers, lakes or existing permanent artificial lines as roads, canals, tourist trails and others. Departments are divided into subsections, which are internally homogeneous in economic terms within the borders of a land belonging to one village. Subdivisions are the smallest unit of forests and forested land. The area of a subdivision is in the range from 1 to 25 ha.

The forest inventory database provided by the State Forestry Agency for the purpose of the project was in digital format and contained:

- **Forest stand attribute database** with detailed description of all forest stands;
- **Stand level GIS maps** with digital borders of forest sites.

No digital information was available for eleven Forest and Game Districts in Bulgaria. The information for seven districts was supplemented entirely or partly (between 20% and 80% of the missing information for each district) by the data from the IBAs database. No GIS information was available for four forest districts.

Overall, six of the nine criteria were extracted from the database: Criterion1 Little or no signs of human influence; Criterion 2 Average age of forest more than X years; Criterion 3 Forests with close to nature spatial structure; Criterion 5 Endangered forest ecosystems and habitats; Criterion 8 Rare broadleaved/coniferous tree or shrub species present and Criterion 9 Functional type forests.
Special algorithms for most criteria and indicators were created that enabled filtering of the forest database. The example of such an algorithm for Criterion 4 Forests with close to nature spatial structure is given in Table 3.

Table 3: Algorithm for identifying BIFs corresponding to Criterion3: Forests with close to nature spatial structure for broadleaved forests with low longevity

Broadleaved forests – low longevity

Indicator I: Type of sub-compartment -1 or 2 (seed or coppice stand)
Indicator II: Structure – uneven – 2
Indicator III: Layer – 2
Indicator IV: Tree species: Downy oak – 28 or Hornbeam – 17 or lime species –20, 97, 98, 99
Indicator V: Share of each tree species (or combination of them) from indicator IV >= 5
Indicator VI: Age of the tree species from indicator V >60
Indicator VII: Stocking rate of the tree species from indicator V >= 0.5
Indicator VIII: Layer II – 3
Indicator IX: Age at least 20 years less than the age of the first layer
Indicator X: Stocking rate of the second layer >2

TIn order to supplement the information on BIFs corresponding to the different indicators of Criterion 1, various other sources of information were used such as management plans and digital maps of protected areas in Bulgaria at BSPB's disposal for the purposes of the project, scientific publications regarding some of the protected areas and the final report "Virgin forests of Bulgaria – inventory and strategy for sustainable management and protection of virgin forests" (Raev & Veen, (ed.), 2005) More detailed information about national parks, reserves and maintained reserves (see Annex 1) was extracted from the IBA database.

The identification of the forests meeting Criterion 6 Presence of forest-dependent species with high conservation significance and Criterion 7 Critical concentration of species was based on available scientific information about the occurrence of species with high conservation significance as well as research conducted during the establishment of the Natura 2000 network in Bulgaria. Detailed information on endangered species distribution in Bulgaria is mostly missing or when such information exists it is so coarsely grained as to make precise identification of species' ranges impossibe and therefore is not applicable for the purposes of the current project. Due to this, the digital forest inventory and the Natura 2000 databases were used for the mapping of both criteria.

The digitalized information on previously identified HCVFs was considered under each criterion taking into account the conformity between BIF and HCVF criteria in Bulgaria. Topographic maps and satellite images were used to verify the information gathered, especially in cases in which the locations of BIFs were uncertain.

ROMANIA

The main source for the project was the national forestry database. The forest inventory database provided by the Forest Research and Management Institute for the purpose of the BRFM project was in tabular format and contained a **Forest stand attribute database and related maps.**

The forestry inventory database was filtered at stand level, but because of a lack of stand level maps, mapping was carried out using the Forestry Divisions' management maps containing the boundaries of forest parcels (one parcel consists of several forest stands). The center of each parcel was digitized and joined with attributes of stands within the parcel borders. The total area fulfilling the criteria inside was obtained by summarizing the different stands within each parcel as a percentage.

Two criteria: Criterion 2 Old growth forest and Criterion 8 Forests where rare broadleaved and coniferous species are present were completely extracted from the forest inventory database. For Criterion 2 Old growth forest the national forestry database were filtered on the basis of following algorithms:

- I1: Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age: If the commercial maturity age of a dominant tree species was set (in case of the production forests category) data was filtered according to the following age standards: "Actual age" (TA) greater than "Cutting age" (TE) with 20 years; if the commercial maturity age of a dominant tree species was not set (in case of the protected forests category) data was filtered according to the following age standards: 140 years old for oak forests, 120 years old for spruce, fir, beech and mixed forests and 100 years old for other forest types;
- I2: Old growth forest with multi layer and multi age structure data was filtered according the multi age structure category from the database (STR=4). Additionally we used close to multi age structure category, filtered according to the following standards: close to multi age structure category from the database (STR=3) and age greater than120 years. In multi-age structure there are all kind of ages; in close to multi age structure, BIFs are above 120 years old and there is arelatively minimum difference of 30 years between species' ages. Both multi-age structure and relatively multi-age structure BIFs overlap with old-growth forest, but are mutually exclusive.

For Criterion1 Little or no signs of human influence, I1: Forests in reserves and I2: Forests in the strict protected areas of the national and nature parks CORINE Land Cover Database (Source CORINE land cover Romania, © DDNI, 2004) was used.
For I3: Virgin forests the database from the final report of the Virgin Forest Project in Romania "Inventory and strategy for sustainable management and protection of virgin forests in Romania" (Biris, I.A., Veen, P., ed., 2005) was used.
For I4: Forests on slopes>35 degrees the information was filtered from the forestry database, but because of large amounts of stands fulfilling this indicator GIS analysis of digital elevation model of the terrain;
(http://www2.jpl.nasa.gov/srtm) was applied.

In order to supplement the information on BIFs corresponding to other criteria Endangered forest ecosystems and Forests within floodplains, forest islands, specific forests on bogs data from the ongoing LIFE+ project (Alpine, subalpine and forests priority habitats in Romania, 2005-2009) were used.

BULGARIA

2.2.5. List of forest types adopted in this project

There isn't any comprehensive national assessment of forest ecosystems, nor does any up-to-date national classification system of forest types in the country exist. For the needs of this project, Bulgarian forests were divided into several forest types according to the classification system of the European Environmental Agency as published in "European forest types: Categories and types for sustainable forest management reporting and policy". Bulgarian forests were classified in eight major forest types:

1. Alpine coniferous forest
1.1. Subalpine larch - arolla pine and dwarf pine forest
1.1.1. *Shrub vegetation of dwarf pine Pinus mugo ssp. Mugo*
1.1.2. *High oro-Mediterranean pine forest*
1.2. Subalpine and montane spruce and montane mixed spruce-silver fir forest [4]
1.3. Alpine scots pine and black pine forest

2. Mesophytic deciduous forest
2.1. Sessile oak-hornbeam forest
2.2. Ravine and slope forest
2.3. Other mesohpytic deciduous forest

3. Beech forest
3.1. Moesian submontane beech forest

4. Montane beech forest
4.1. Central European montane beech forest
4.2. Oriental beech and hornbeam-oriental beech forest

5. Thermophilous deciduous forest
5.1. Downy oak forest
5.1.1. *Downy oak (Quercus pubescens) forest*
5.1.2. *Turkey oak (Quercus cerris) forest*
5.2. Turkey oak, Hungarian oak and Sessile oak forest
5.3. Chestnut forest
5.4. Other thermophilous deciduous forest

6. Coniferous forest of the Mediterranean, Anatolian and Macaronesian regions
6.1. Mediterranean and Anatolian black pine forest
6.2. Juniper forest

7. Mire and swamp forest
7.1. Conifer dominated or mixed mire forest

8. Floodplain forest
8.1. Riparian forest
8.2. Fluvial fores

4 This forest type includes also the mixed coniferous-broadleaved forests.

ROMANIA

Of major importance affecting ecological conditions in Romania are climate conditions, geographically determined by the transition from an atlantic to a continental climate, and also to the Carpathian range that significantly influences the climate according to altitude (Donitsa et.al., 2005), large rivers and the Danube Delta. Romanian forests were classified as one of nine major forest types:

1. **Boreal forest of spruce, larch, Swiss pine and Scots pine**
2. **Mesophile forests of mixed beech and coniferous species**
3. **Mesophile forest of beech in mountain areas**
4. **Mesophile forest of beech in hill areas**
5. **Mesophile and thermophile forest of sessile oak**
6. **Mesophile and thermophile forest of (pedunculate) oak**
7. **Thermophile forests of Turkish oak and Hungarian oak**
8. **Thermophile forests of (pedunculate) oak and pubescent oak**
9. **Meadow forests of alders, poplars, willows, ash and oaks**

2.2.6. Structure of the BRFM database

The GIS-based database on BIFs is organised on three levels of details:
Level 1: **Forest stand level** covers the areas for which digital maps at the forest stand level were available; these are associated with information from forestry records
Level 2: **Forest division level** covers the areas for which the simplified digitalization of forest compartments (blocks) on the basis of topographic maps and forest maps was carried out. This level was not applied in either country, but it was applied in the previous mapped countries.
Level 3: **Generalised level** (for public access) is composed of a 25-ha grid (squares with 500 x 500 m size) which uniformly covers the entire project region and corresponds with similar generalized coverage from other BIF countries.
For each 25-ha square, the total contribution of forests in that area was calculated (in both countries on the basis of CORINE Land Cover), as well as the contributions of forests meeting individual BIF criteria and the total contribution of forests that meet at least one BIF criterion. Standard GIS tool were used to generate the 25-ha grid and to assign digital data on contributions of forests that meet individual criteria. In respect of the technical limits of software and hardware, 25 ha seemed to be the smallest area unit that enabled an effective searching of the GIS-based database along with graphic presentation of the results.

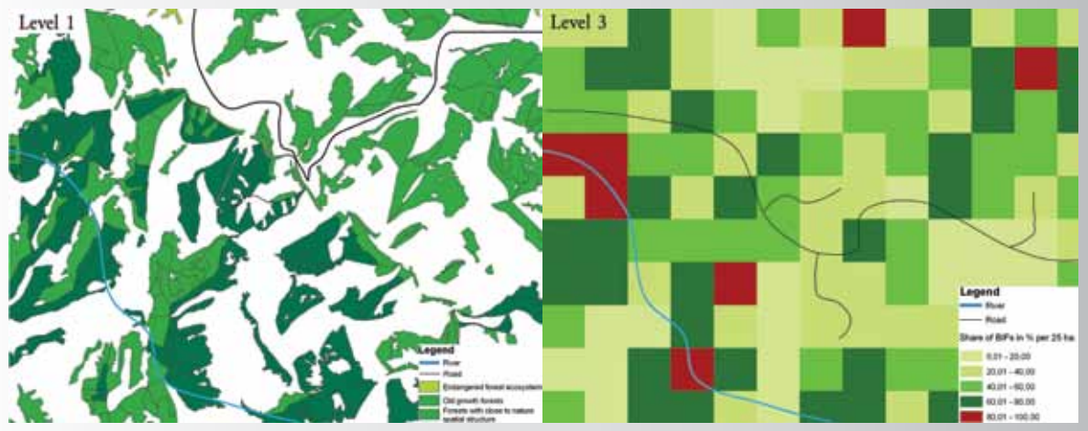


Fig.1 Examples of maps at Levels 1 and generalized map at Level 3

In Romania, because of a lack of digital maps of forest stands and heterogeneity among different spatial data sets (points and polygons) it was impossible to calculate the overall area of BIF inside each square of 25 ha of the grid i.e. if a pixel contains 80% of total forest and uknown proportion of the forested part is BIF, the whole pixel is assigned 80% value. For this reason, the percentage of BIFs in Romania is overestimated.

III. RESULTS OF THE PROJECT

3.1. BIFs in Bulgaria and Romania

Forests in the project area (Bulgaria and Romania) fulfilling at least one of the BIF criteria are estimated to cover 22.6% of the countries' total combined forest areas.

Table 4: BIFs in Bulgaria and Romania by area and percent coverage

Country	Total forest area, ha	Total area of the BIFs, ha	Share of BIFs, %
Bulgaria	4,1 million	936,561	22,8
Romania	6,2 million	1,396000	22,5
Total	10,3 million	2,332561	22,6

Figure 2 presents BIF concentration in the project area. It is acquired through calculating the percentage of BIFs per pixel (25ha) in Bulgaria (Level 3) and percentage of total forest cover which contains any BIFs for Romania. Red areas represent concentration of forests with HNV that deserve special protection and management. The heterogeneity of the different spatial data sets in Romania (some as points, others as polygons) made it impossible to calculate the overall surface of BIF meeting a specific criterion at Level 3 (inside each square of 500 x 500 m of the grid).

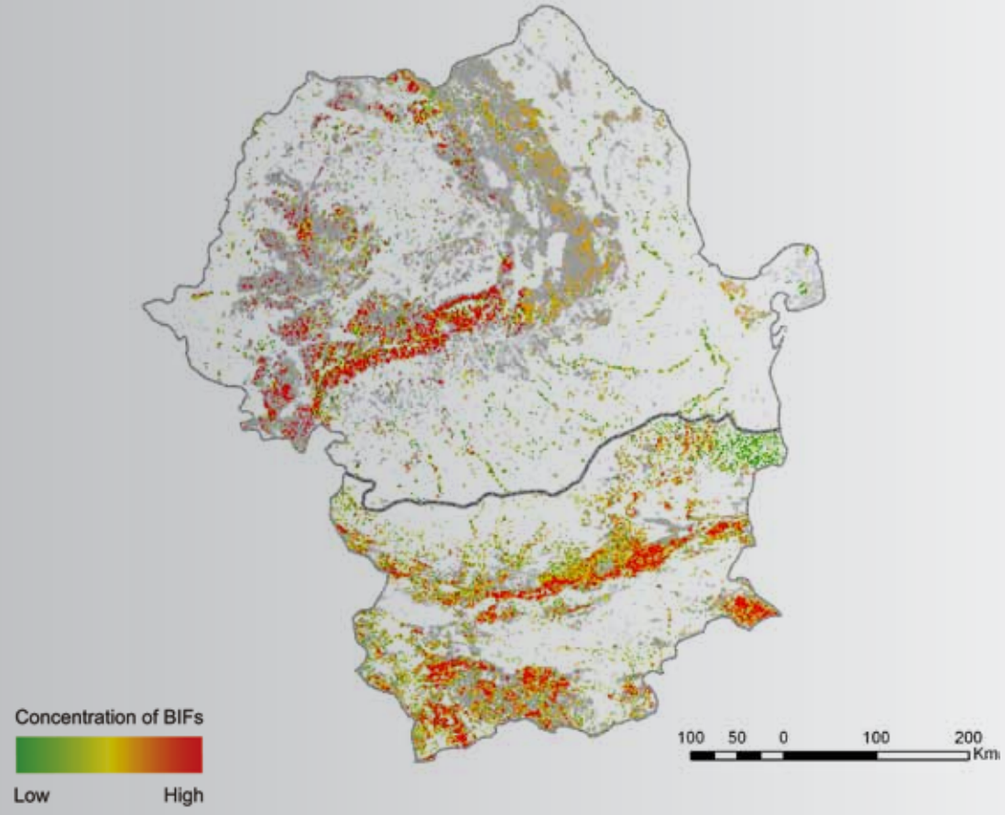


Fig. 2: Map of BIF concentration in Bulgaria and Romania

3.2. BIFs by ownership categories

According to the Annual report of the State Forestry Agency for 2007, forests in Bulgaria were divided by ownership as follows: 76% of the forests belong to the state, 12% to municipalities, 10% to private entities and 2% have other ownership. The woodlots in individual ownership are very small in Bulgaria, most of them around 1 ha in size. Only around 5% of the forest holdings are in private ownership exceed 50 ha (Small forest owners in Bulgaria report, WWF, 2007). Following this division, 76.6% of the BIF's in Bulgaria belong to the state, 7.9% are to 7.9% to municipalities and 4.7% to private owners (Fig. 3).

Private and municipal BIFs are distributed irregularly throughout the country. While the municipality BIFs are often complexes of around 1000 hectares, the private ones are small (below 1 ha) and isolated. The protection of these BIFs (both municipal and private) is a great challenge in the near future.

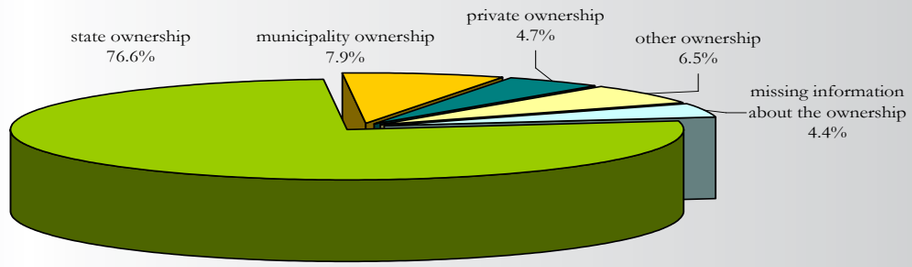


Fig.3: Distribution of BIFs by type of property in Bulgaria

The analysis of the ownership distribution was made according to the available information in the forestry database. Ownership information is missing for 4.4% of the BIFs in Bulgaria. Additionally, the available information was often not fully up-to-date and not harmonized with the map of the ownership structure after the recent changes due to the re-privatization programme. Therefore, the margin of error was quite high even for forest and game districts, for which the forestry database was prepared over the last 2-3 years.

There was no ownership information in the forestry inventory database provided by the Forest Research and Management Institute, preventing analysis of distribution of BIFs by ownership from being carried out for Romania.

3.3. BIFs by forest types

The share of BIFs in different forest types was estimated based on the forestry records and other available sources of information and covers all identified BIFs in Bulgaria. Recognition of each BIF forest type was difficult due to the lack of a current national classification system of forest types (the existing one is from 1969, "Forest types in Bulgaria" (Penev et.al.)). The BIF distribution under the selected classification system of the European Environmental Agency (the European forest types: Categories and types for sustainable forest management reporting and policy) was assessed through a specially developed algorithm based on the species composition in the dominant tree canopy layer (Tab. 5).

The mapping of one forest type – Mire and swamp forests, wasn't possible due to lack of data.

Table 5: Contributions of particular forest types to BIFs in Bulgaria

	Forest type	Area, ha	Percent from the total BIFs
1	Alpine coniferous forest		
1.1	Subalpine larch - arolla pine and dwarf pine forest		
1.1.1	*Shrub vegetation of dwarf pine Pinus mugo ssp. Mugo*	15385.8	1.6%
1.1.2.	*High oro-Mediterranean pine forest*	41155.8	4.3%
1.2.	Subalpine and montane spruce and montane mixed spruce-silver fir forest	64466.5	6.8%
1.3.	Alpine scots pine and black pine forest	47939.4	5.0%
2	Mesophytic deciduous forest		
2.1.	Sessile oak-hornbeam forest	114076.4	11.9%
2.2.	Ravine and slope forest	44481.9	4.6%
3.	Beech forest		
3.1.	Moesian submontane beech forest	37567.7	3.9%
4.	Montane beech forest		
4.1.	Central European montane beech forest	181613.9	19.0%
4.2.	Oriental beech and hornbeam-oriental beech forest	42962.2	4.5%
5	Thermophilous deciduous forest		
5.1	Downy oak forest		
5.1.1	*Downy oak (Quercus pubescens) forest*	33530.1	3.5%
5.1.2	*Turkey oak (Quercus cerris) forest*	58063.0	6.1%
5.2	Turkey oak. Hungarian oak and Sessile oak forest	134206.8	14.0%
5.3.	Chestnut forest	4532.5	0.5%
5.4	Other thermophilous deciduous forest	66414.4	6.9%
6.	Coniferous forest of the Mediterranean, Anatolian and Macaronesian regions		
6.1.	Mediterranean and Anatolian black pine forest	41649.7	4.4%
6.2.	Juniper forest	1376.5	0.1%
7.	Mire and swamp forest		
7.1.	Conifer dominated or mixed mire forest	no data	no data
8	Floodplain forest		
8.1.	Riparian forest	9678.9	1.0%
8.2	Fluvial forest	13020.1	1.4%
		TOTAL	100%

In Bulgaria Central European montane beech forests is a forest type having the highest contribution to the country's BIF resources (19%). It is followed by Sessile oak - hornbeam forests and Turkey oak, Hungarian oak and Sessile oak forests, providing 11.9% and 14% of BIFs respectively. They are followed by Other thermophilous deciduous forests (6.9%), probably because include both highly endangered forest ecosystems, such as forests dominated by *Aesculus hippocastanum*, and more common communities of *Carpinus orientalis*. Distribution is a derivative of the fact that deciduous forests in general dominate in Bulgaria, covering 70.4% of the country's total forest area.

The total area of BIFs in coniferous forest types (incl. the mixed deciduous-coniferous forests) is 22.2% of Bulgarian BIF area, comparing to 29.6% of the total share of coniferous communities (including coniferous forest plantations) in the whole forested area. The coniferous BIFs are dominated by Subalpine and montane spruce and montane mixed spruce-silver fir forest – 6.7% of the total BIF area in Bulgaria. Also the BIFs in High oro-Mediterranean pine forests are relatively well represented, particularly in less accessible high mountain regions.

The Moesian submontane beech forests occupy 3.9% of the total BIF area in Bulgaria and the Oriental beech and hornbeam-oriental beech forests occupy 4.5%. These forests are situated predominantly in the lower mountain regions where the anthropogenic pressure is more intensive as compared to the Montane beech forests in the upper mountains. Therefore their share is also relatively low. The same applies to Downy oak forests and Turkey oak forests, contributing to 3.5% and 6.1% of BIFs, respectively.

The remaining forest types contribute to merely 8% of BIFs due to their naturally limited distribution in Bulgaria. However, some of them are very valuable and rich in biodiversity (e.g. riparian and floodplain forests) and their preservation should have a high priority.

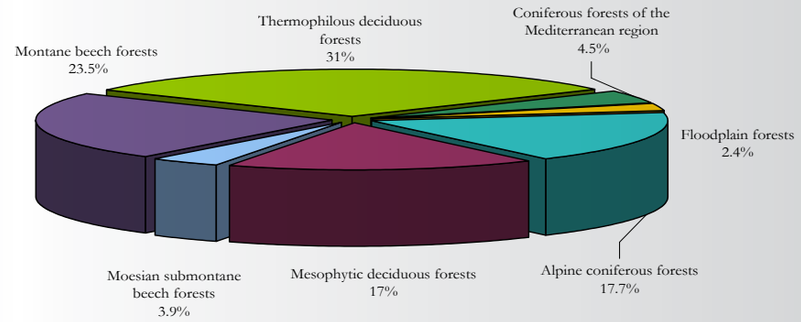


Fig.4: Contributions of particular forest types to BIFs in Bulgaria

BIFs types classification varies between Bulgaria and Romania. The contribution of individual forest type to BIFs in Romania is presented in Table 6.

Table 6: Contribution of individual forest types to BIFs in Romania

	Forest type	Area, ha	Percent from the total BIFs
1	Boreal forest of spruce, larch, Swiss pine and Scots pine	204 500	14.65
2	Mesophile forests of mixed beech and coniferous species	305 000	21.85
3	Mesophile forest of beech in mountain areas	249 000	17.84
4	Mesophile forest of beech in hill areas	191 000	13.68
5	Mesophile and thermophile forest of Sessile oak	66 000	4.73
6	Mesophile and thermophile forest of (pedunculate) oak	55 600	3.98
7	Thermophile forests of Turkish oak and Hungarian oak	55 700	11.9%
8	Thermophile forests of (pedunculate oak) and pubescent oak	52 200	3.74
9	Meadow forests of alders, poplars, willows, ash and oaks	217 000	15.54
	TOTAL	1 396 000	100%

The most common BIF type in Romania is Mesophile forests of mixed beech and coniferous species, representing 21.9% of all BIFs, followed by Mesophile forest of beech in mountain areas (17.8% of total BIFs). This is largely the result of the dominance of beech (31,5%) and spruce (21%) among forest tree species in Romania and the high proportion of Romanian forests situated in the Carpathian Mountains.

In third place according the acreage is the type Meadow forests of alders, poplars, willows, ash and oaks (15.5%). Distribution of this forest type is mainly in lowlands, along the large rivers, especially in Southern and Eastern Romania along the Danube and its tributaries, as well in the Danube Delta. As BIFs exclude poplar plantations, the share of Meadow forests of alders, poplars, willows, ash and oaks forest type is relatively high comparing to the overall contribution of softwood deciduous communities to the forested area of Romania (5.7%). Many such forests are not intensively managed or are covered by the protected areas system.

Mesophile forest of beech in hill areas account for approximately 13.8% of BIFs. Their lower contribution to BIFs as comparing to Mesophile forest of beech in mountain areas is probably caused by their greater accessibility in the lower mountain regions where the anthropogenic pressure is higher, and their economic use is more intensive than at higher altitudes.

Other BIFs are represented by Mesophile and thermophile forest of pedunculate oak (3.98%), Thermophile forests of Turkish oak and Hungarian oak (3.99%), and Thermophile forests of pedunculate oak and pubescent oak (3.74%). These forests are mainly scattered throughout lowlands and hilly regions, usually between 0 and 300 meters, and they are subject to the increased anthropogenic pressure as compared to mountain forests.

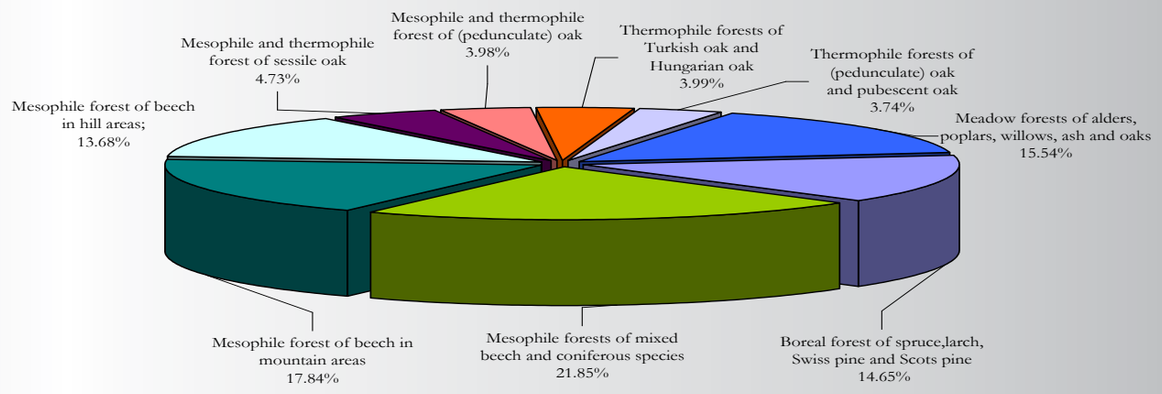


Fig.5: Contributions of individual forest types to BIFs in Romania

None of the distinguished forest types can be regarded as protected by definition. This is why specific protection measures aimed to preserve BIFs should be adopted. Depending on a wider context, these should be either non-intervention management, restoration management with active conservation, or biodiversity-friendly forest management.

3.4. BIF by criteria

The most commonly met BIF selection criterion in Bulgaria is Endangered forest ecosystems and habitats (72%). This is due to its inclusion of forest ecosystems from the list of Annex 1 of the Habitats Directive. Many forests in the list are endangered and rare at the European level, particularly in Western Europe, but are relatively widespread in Bulgaria. The standard forest stand description in forestry records, because of its simplicity, does not enable unambiguous mapping of all endangered vegetation types, so further data analysis to identify "real" BIFs meeting the criterion Endangered forest ecosystems and habitats is needed. Fulfilling this criterion were considered additional habitats in accordance with the Bulgarian Red Book of natural habitats, all priority habitats included in Annex 1 of the Habitats Directive, and other habitats from Annex 1 which fall within the Natura 2000 network and meet other criteria determining the ecological importance of the biodiversity valuable forests in Bulgaria (Table 7).

Table 7: Shares of BIFs that meet particular criterion

Criteria	Area, ha	Share (%)[5]
Cr 1: Forests with no or limited human activities	308299.3	32.2%
Cr 2: Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age	229075.4	23.9%
Cr 3: Considerable amount/long term continuum of dead wood	no data	
Cr 4: Forests with close to nature spatial structure	58506.0	6.1%
Cr 5:Endangered forest ecosystems and habitats	686902.8	71.7%
Cr 6: Presence of forest-dependent species with high conservation significance	378841.6	39.5%
Cr 7: Critical concentration of species	612317.2	63.9%
Cr 8: Forests where rare broadleaved and coniferous species are present	119931.2	12.5%
Cr 9: Functional type forests	30163.1	3.1%

5 Values in the column "Share (%)" do not sum up to 100%, because many forest stands meet more than one criterion

According to initial analysis, forests older than 100 years comprised 10.8% of total forest cover in Bulgaria. The percentage of extremely old forests, with preserved natural features and probably containing large amounts of dead wood, was much lower, only 23.9% of the identified BIFs, or 6% of total forest cover. Most of these forests are situated in areas untouched by human activities.

The low proportion (app. 6%) of BIFs are Forests with close to nature spatial structure is a consequence of forest management practices in Bulgaria and the prevalence of short term gradual felling leading to the development of the same age stands with homogeneous spatial structure, for example, one layer stands.

Forests with no or limited human activities are 32.2% of all BIFs and account for 7.5% of forests of the country. Most of them are located in mountainous areas - Rila, Pirin, Rhodope Strandza, Balkan Mountains. The six indicators within this criterion fully or partially overlap.

BIFs meeting Criterion 6 Presence of forest-dependent species with high conservation significance (app. 40% of total BIFs) and Criterion 7 Critical concentrations of species often overlap (app. 64%) and in most cases meet more than one criterion. As detailed and digital data about endangered species' habitats in Bulgaria is incomplete, the main source of information used for identifying these forests were the IBA database, the Atlas of Nesting Birds in Bulgaria, the results of the survey for mapping Key Butterfly Areas in Bulgaria, and distribution data on species significant to conservation such as brown bear. Thus, the share of forests meeting these two criteria is likely overestimated and requires additional finer scale data and field studies.

Stands qualified under Criterion 8 Rare broadleaved/coniferous tree or shrub species present correspond to 12.5% of the total BIFs area. Forestry practices in Bulgaria that tolerate the presence of such species, mainly forest fruit-trees, should be promoted. The area of Functional type forests is only 3.1%, which consists mainly of forest shelter belts in the Danube plain.

The contributions of different forest types to BIFs that meet individual criteria are varied (Fig. 6).

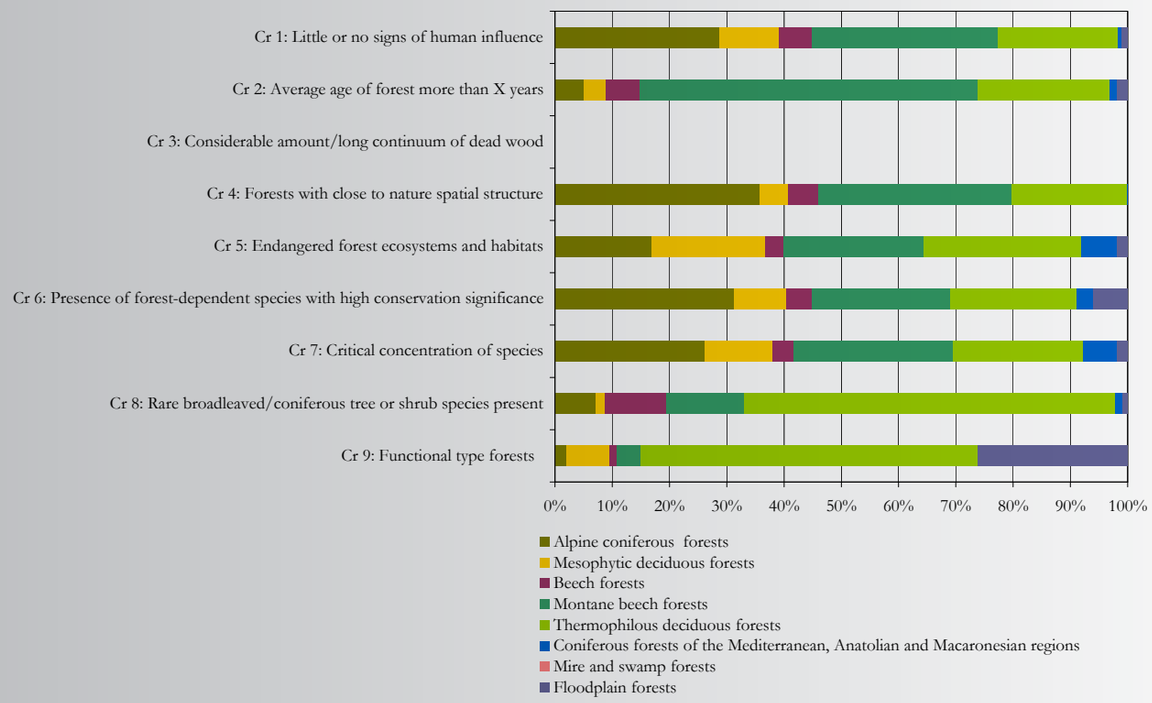


Fig.6: Contributions of particular forest types to BIFs that meet particular criteria

The most criteria are met by the BIF forest type Montane beech forests because of their wide distribution in Bulgaria and their locations in national and nature parks.

Under Criterion 1 Alpine coniferous and Mountane beech forests dominate, which is most due to the majority of strictly protected areas in Bulgaria being located in the higher parts of mountains. These forests are inaccessible on steep slopes and therefore human activities are limited.

Relatively low is the share of lowland forest ecosystems such as different types of Mesophytic deciduous forest and Floodplain forests in Criterion 2. These ecosystems are located in easily accessible areas and for that reason the anthropogenic pressure on them is higher. They often can not pass commercial maturity age, as they are harvested upon maturity.

In Criterion 4 Forests with close to nature spatial structure four types of forests are equally distributed: Subalpine and montane spruce and montane mixed spruce-silver fir forest, Central European montane beech forest, Alpine Scots pine and black pine forest and Turkey oak, Hungarian oak and Sessile oak forest . The prevalence of the first two types is most probably due to the nature of mixed coniferous-deciduous ecosystems which include several tree species with diverse ecological requirements, a precursor of complex spatial structure. Forests of white pine usually have a rich variety of structure and species composition, the existence of different tree species in them is a sign of their dynamic status. The presence of Turkey oak, Hungarian oak and Sessile oak forest is also a prerequisite for a well-developed spatial structure.

Criteria 5, 6 and 7 are among the most diverse with regard to BIF forest type presence and include a wide variety of forest types. It is worth noting the presence of Floodplain forests in comparison to the other criteria. It indicates the prime importance of these ecosystems to the protection of high conservation value species. Many such forests have been destroyed, and restoration of riparian habitats with native plant species should be a priority.

The proportion of Floodplain forests is comparatively high under Criterion 9 Functional type forests. This criterion covers all forests, located mainly in the plains and lowlands, so lowland forest ecosystems such oak forests of Thermophilous deciduous forest prevail in it.

In the criterion Presence of rare broadleaved/coniferous tree or shrub species, two forest types prevail: Montane beech forests and of Thermophilous deciduous forest, particularly Turkey oak, Hungarian oak and Sessile oak forest, as they are revealed by other criteria to be forest types of great environmental significance and possessing characteristics necessary for the maintenance of high biodiversity.

Three BIFs types: Montane beech forests, Beech forests and Floodplain forests have the highest conservation value, with more than 50% of these forests meeting three or more criteria.

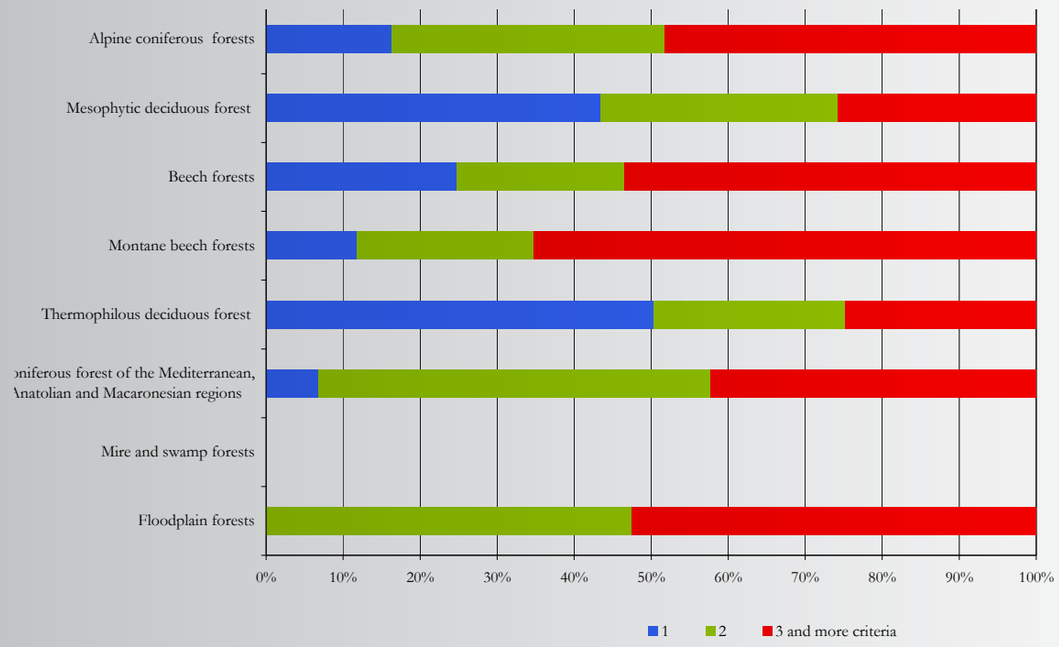


Fig.7: Share of BIFs that meet one, two, three and more criteria within individual forest types in Bulgaria

The forest types Shrub vegetation of dwarf pine Pinus mugo ssp. Mugo and High oro-Mediterranean pine forest are particularly noteworthy for meeting more than one criteria, as are, to a lesser extent, Fluvial, Riparian and Juniper forest (Figure 8). It is evident that these forest types should be conservation priorities.

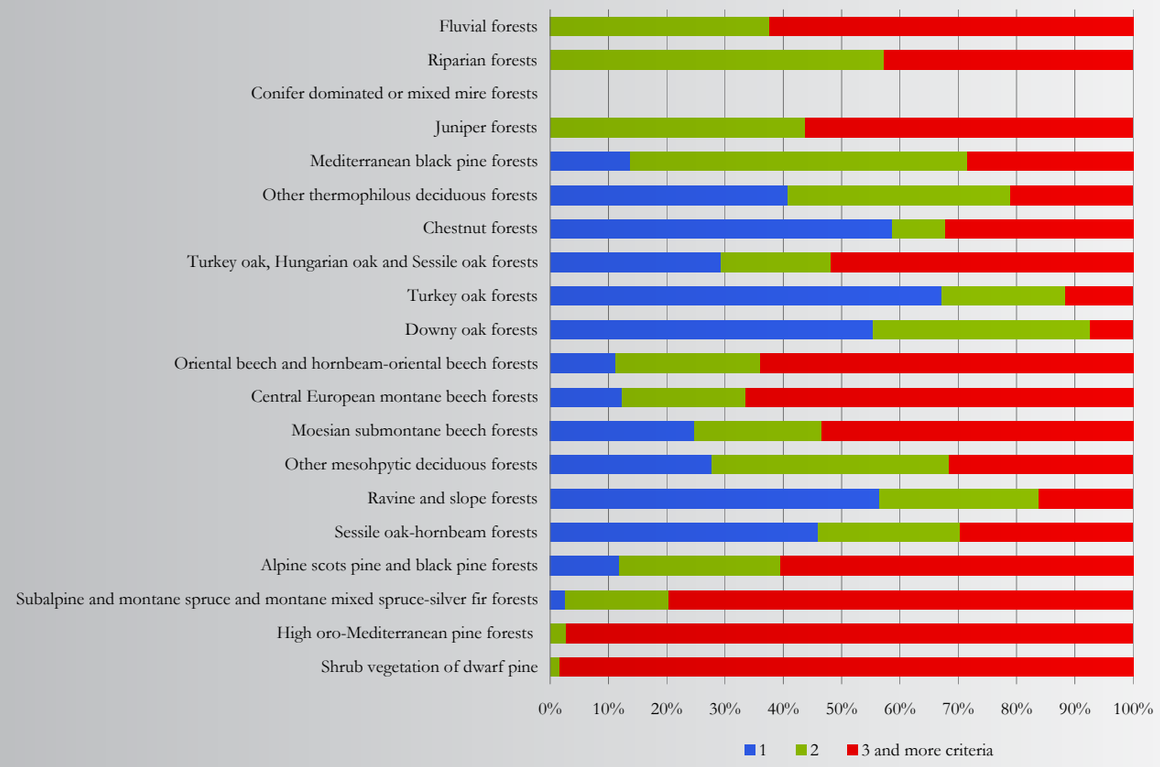


Fig.8: Share of detailed BIFs that meet one, two, three and more criteria within individual forest types in Bulgaria

Most of the BIFs in Romania (53%) match the Forests with no or limited human activities criterion (Table 8). Since almost half of Romanian forests (covering about 13% of the country) have been managed with a view to watershed conservation rather than production, Romania still has one of the largest areas of undisturbed forest in Europe. This criterion is attributable with prevalence of forests situated in the Carpathian Mountains (app. 58% of total forest cover) and also due to other factors, including steep, inaccessible slopes, low road density and limited access.

Many BIFs satisfy the Old growth forest (30% of all BIF) or Forests within floodplains, forest islands, specific forests on bogs (17%) criteria.

The proportion of BIFs meeting Criterion 6 Critical concentration of species (34%) is probably overestimated, due to the inclusion of all forests fulfilling at least one of the rests of BIF criteria in this category.

Table 8: Shares of BIFs that meet individual criteria

Criterion	Area, ha	Share (%)[6]
Cr 1: Forests with no or limited human activities	732 000	53
Cr 2: Old growth forest	420 500	30
Cr 3: Considerable amount/long term continuum of dead wood	no data	
Cr 4: Endangered forest ecosystems and habitats	105 500	8
Cr 5: Forests within floodplains, forest islands, specific forests on bogs	241 000	17
Cr 6: Critical concentration of species	476 500	34
Cr 7: Forests that are habitats of endangered, rare and endemic forest dependent species of plants and animals	insufficient data	
Cr 8: Forests where rare broadleaved and coniferous species are present	105 000	8

A low proportion of BIFs (8%) are Endangered forest ecosystems and habitats and Forests where rare broadleaved and coniferous species are present.

Boreal forest of spruce, larch, Swiss pine and Scots pine turned out to have the highest conservation value, with 6% of forests meeting more than 3 criteria. Satisfying at least one criterion are 68% of Mesophile and thermophile forest of (pedunculate) oak and 72% of Thermophile forests of Turkish oak and Hungarian oak.

6 Values in the column "Share (%)" do not sum up to 100%, because many forest stands meet more than one criterion

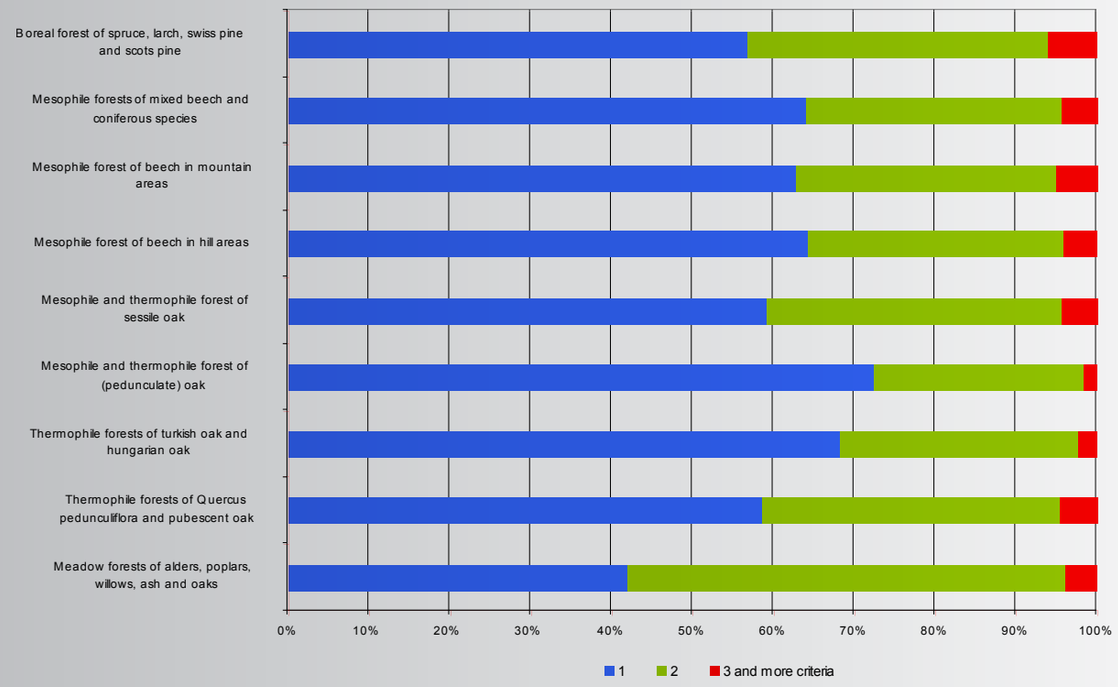


Fig.9: Share of BIFs that meet one, two, or more criteria within particular forest types in Romania

Nearly 73% and 40% of BIFs meet more than one criterion in Bulgaria and Romania, respectively (Fig. 10). Approximately 48% of BIFs meet three or more criteria in Bulgaria and 4.4% meet more than three criteria in Romania. The highest number of criteria a forest unit meets in both countries is five. Such forests are very rare and represent only 8% of the total area of BIFs in Bulgaria (respectively, only 2% of total forest cover of the country) and only 0.01% of the total area of BIFs in Romania and exist only in the national parks in the mountain region (with a higher density in South-Western part of the country) and in the Danube Delta Biosphere Reserve.

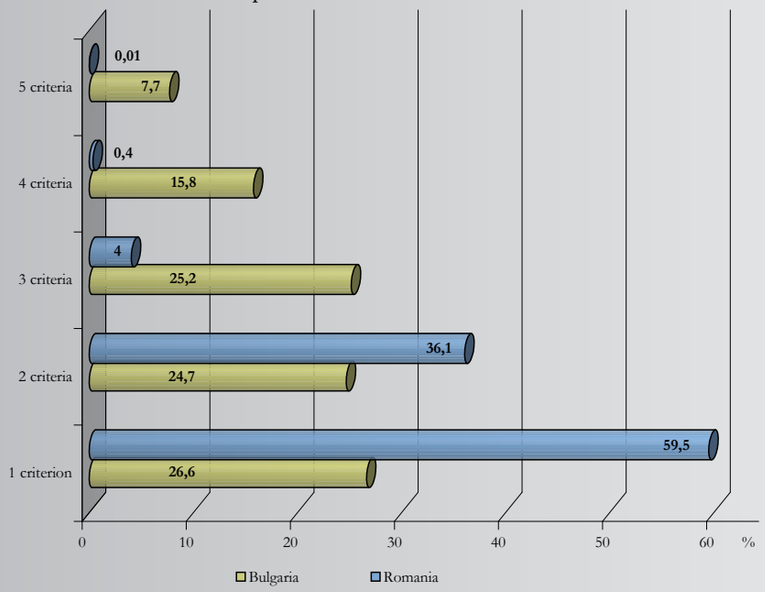


Fig.10: BIFs by the number of BIF criteria they meet in Bulgaria and Romania

BIFs meeting more than one criterion should be of great concern and subject to special forest management, as they are likely to have considerable biodiversity conservation potential.

3.5. Analysis of the spatial structure of BIFs

The spatial distribution of BIFs in individual Regional Forestry Directorates (RFDs) of the State Forestry Agency in Bulgaria is a reflection of not only prevailing climatic and edaphic conditions, but is also by locally preferred forestry methods. Many of the regional directorates are responsible for areas covering both mountains and lowlands, resulting in great forest ecosystem diversity. There is no prominent prevalence of certain types of forests.

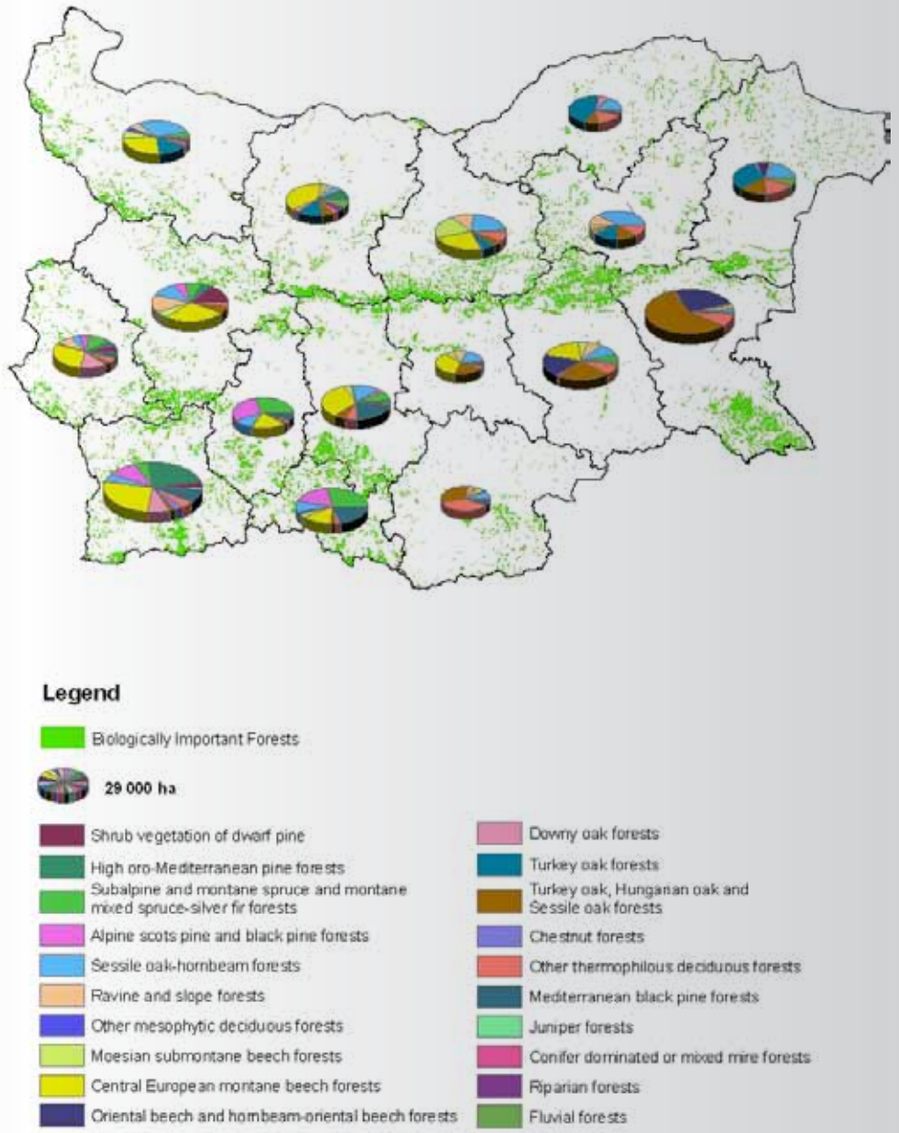


Fig. 11: BIFs by forest types in individual RFDs, Bulgaria

The Blagoevgrad and Burgas, RFDs located respectively in the southwestern and southeastern part of Bulgaria, are the most rich in BIFs. Several protected areas including Pirin National Park and Belasitza Nature Park, part of Rila national park are situated in the Blagoevgrad RFD. Burgas RFD also covers areas of great biodiversity, including the southeastern slopes of the Balkan Mountains and Strandza, the Bulgaria's largest nature park and Silkosia which is Bulgaria's oldest reserve. This region is dominated by Turkey oak, Hungarian oak and Sessile oak forest and Oriental beech and hornbeam-oriental beech forest.

The concentration of BIFs in lowland areas (RFDs: Kardjali, Stara Zagora, Shumen, and Ruse) is relatively low, mainly due to easier access to forests and extensive logging over many years.

The most commonly met criterion in all RFDs is Endangered forest ecosystems and habitats due to the inclusion under this criterion of endangered habitats listed by Annex 1 of the Habitats Directive, such as Montane beech forests and Turkey oak, Hungarian oak and Sessile oak forests which are quite widespread in Bulgaria. In the RFDs of northeastern Bulgaria, forests meeting Criterion1 Forests with no or limited human activities and Criterion 2 Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age are almost entirely absent. In these directorates Forests of a functional type (Criterion 9) dominate because of the presence of many forest shelter belts. BIFs meeting Criterion 4 Forests with close to nature spatial structure are very small in size and fairly evenly distributed throughout the country.

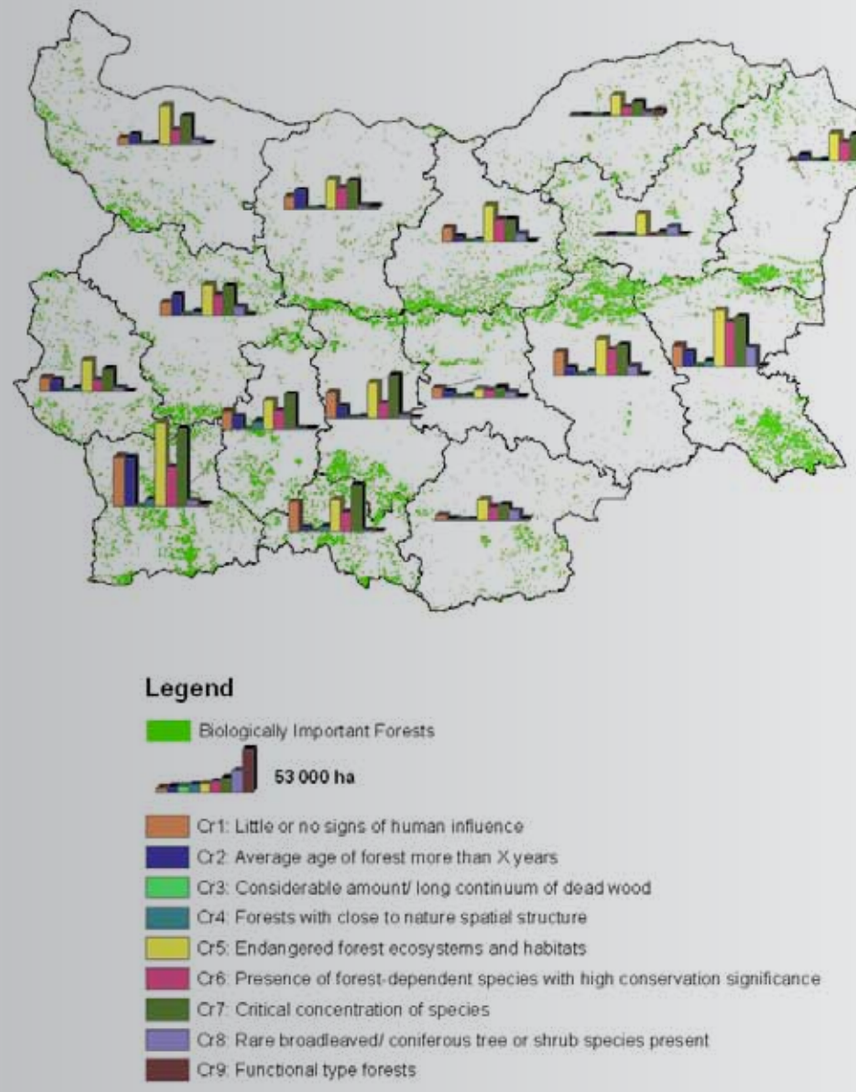


Fig. 12: BIFs by criteria type in individual RFDs, Bulgaria

The analyses of the spatial distribution of BIFs in Romania were made according to the NUTS 3 [7] administrative Regions of Romania, the equivalent of Euro regions. The regions are the Northwest, West, Southwest, South, Southeast, Northeast and Centre.

The spatial distribution of BIFs in individual administrative regions is influenced by prevailing climatic conditions and other environmental factors. In the Central and Northwestern regions, the most predominant forest types are Beech and coniferous-beech mixed forests in mountain areas and Mesophile and thermophile forests of Sesile and Pedunculate oak in hilly regions. In the Southwestern and Southern regions a large percentage of BIFs are Meadow forests of alders, poplars, willows, ash and oaks, due to the presence of large rivers such as the Danube, Olt, Jiu, and Ialomita. In comparison to the other regions, in the South, Southeast and East we observe a relatively high percentage of Thermophile forests of *Quercus pedunculiflora* and pubescent oak. In western Romania (the Western, Southwestern and Northwestern regions), in lower and dryer areas we can find a significant percent of Thermophile forests of Turkish oak and Hungarian oak.

Fig 13: BIFs by forest types in individual NUT3 administrative regions, Romania

7 Nomenclature of Territorial Units for Statistics (NUTS), III territorial level

In the Northwest, West, Southwest and Central regions, the highest proportion of BIFs are those meeting Criterion 1 Little or no signs of human influence. This corresponds with mountainous relief, limited access to those forests and concentration of protected areas. In the Southeast region where the Danube Delta is located, most BIFs meet Criterion 6 Critical concentration of species. Forests meeting Criterion 5 Forests within floodplains, forest islands, specific forests on bogs prevail in the Southern and Southwestern regions. Most of these forests are located on the Danube islands and also meet Criterion 1.

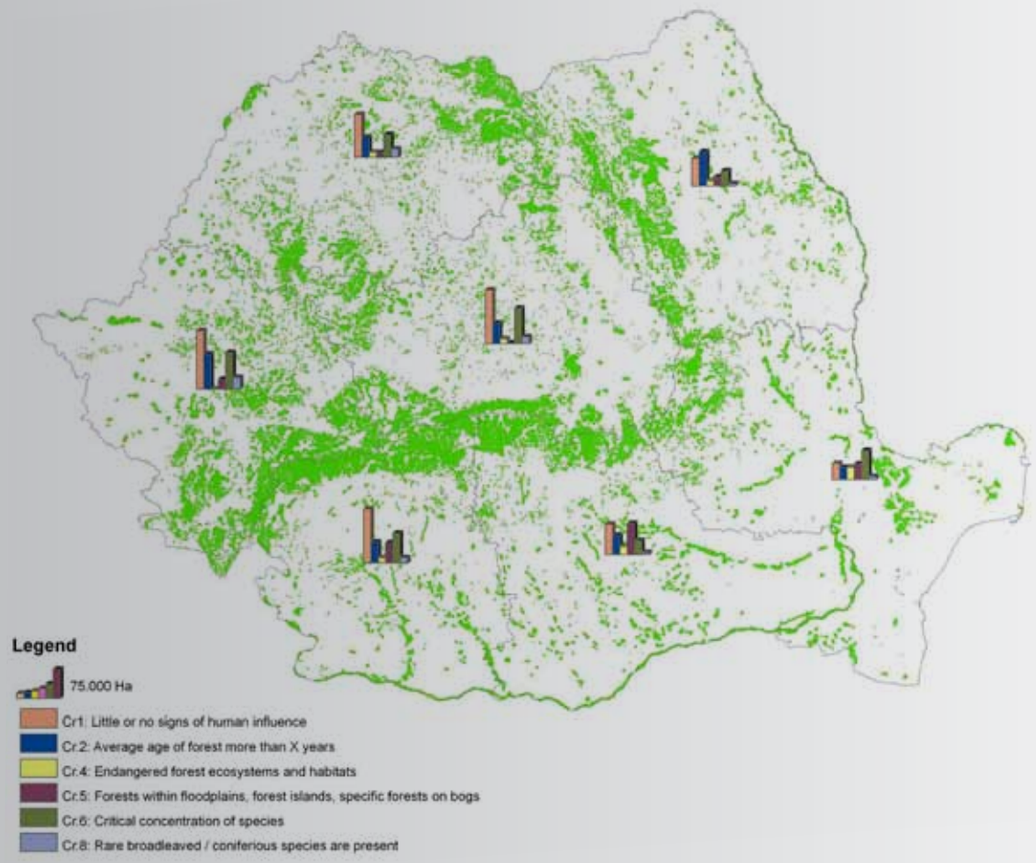


Fig. 14: BIFs by criteria in individual NUT3 administrative regions, Romania

3.6. Analysis of protection status of BIFs

3.6.1. BIFs and national protected area network

The analysis of BIF protection status is based on a comparison of the distribution of BIFs and digital maps of protected areas in both countries.

Category	Description in Bulgaria	Description in Romania
Unprotected	All BIFs outside of the protected area network	All BIFs outside of the protection area network
Strictly protected	BIFs in reserves, national parks and maintained reserves	BIFs in reserves and national parks
Partially protected	BIFs in nature parks, protected sites and natural monument	BIFs in natural parks

The comparison of BIFs with protected areas in Bulgaria is based mainly on digital maps of national and nature parks, reserves, maintained reserves as well as other protected areas. Approximately 15% of the total area of BIFs in Bulgaria are strictly protected (3.1% of the total forest area in the country); a further 10.4% of BIFs' total area are partially protected (2.3% of total forest cover), and the rest (74.8% of BIFs which comprise 17.6% of the total forest cover) have no protection status at all. In Romania, only 8% of BIFs are strictly protected, however, comprising merely 1.8% of the total forest area in Romania. Another 18% of BIFs are partially protected inside national parks, natural parks and other reserves (approx. 4% of the total forest cover). The large majority of identified BIFs fall outside current protected area network (Fig.15).

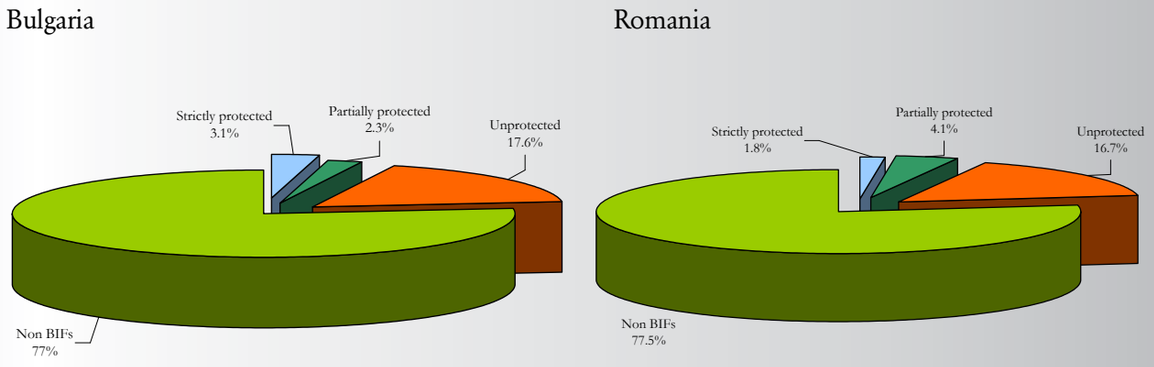


Fig. 15: Share of different protected categories of BIFs to tatal forest cover in Bulgaria and Romania

In Bulgaria, protected BIFs (strict and partial) are predominantly located in mountainous regions (Fig. 16). In Romania, BIFs under strict protection are mostly located in the mountain regions such as national parks: Retezat, Domogled-Valea Cernei, Apuseni and Cozia, Rodnei, but also along rivers in such places as Lunca Muresului and Balta Mica and Brailei National Parks and in the Danube Delta Biosphere Reserve (Fig.17). The Danube Delta Biosphere Reserve is the 22nd largest protected area in the world and the 3rd largest in Europe (Romania Biodiversity Assessment 2001).

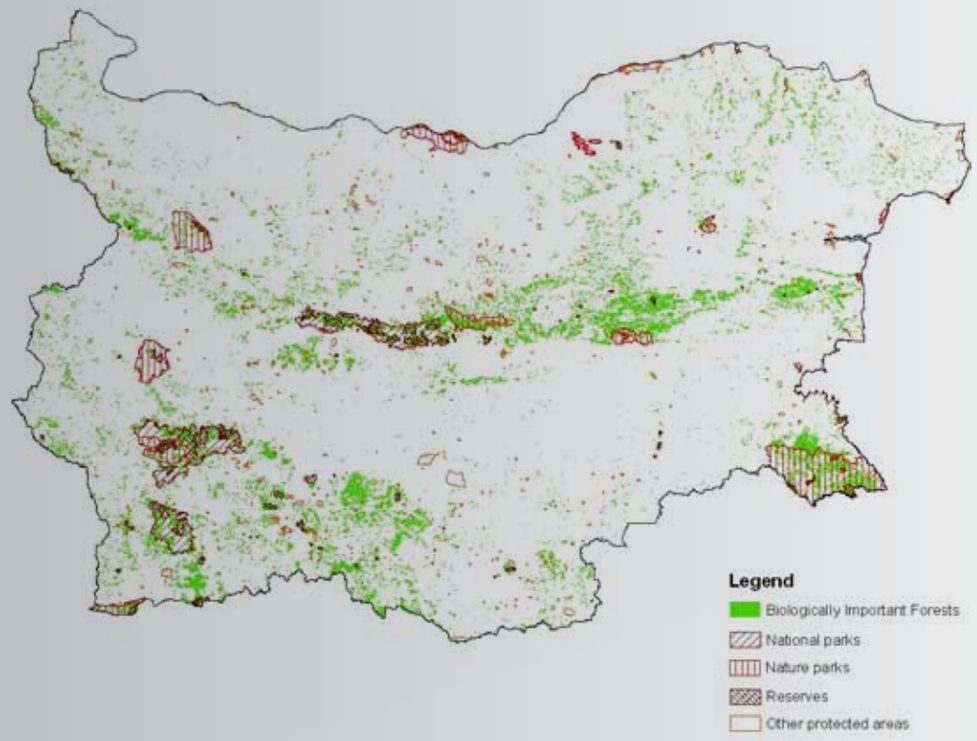


Fig. 16: BIFs in and outside of the protected areas network in Bulgaria

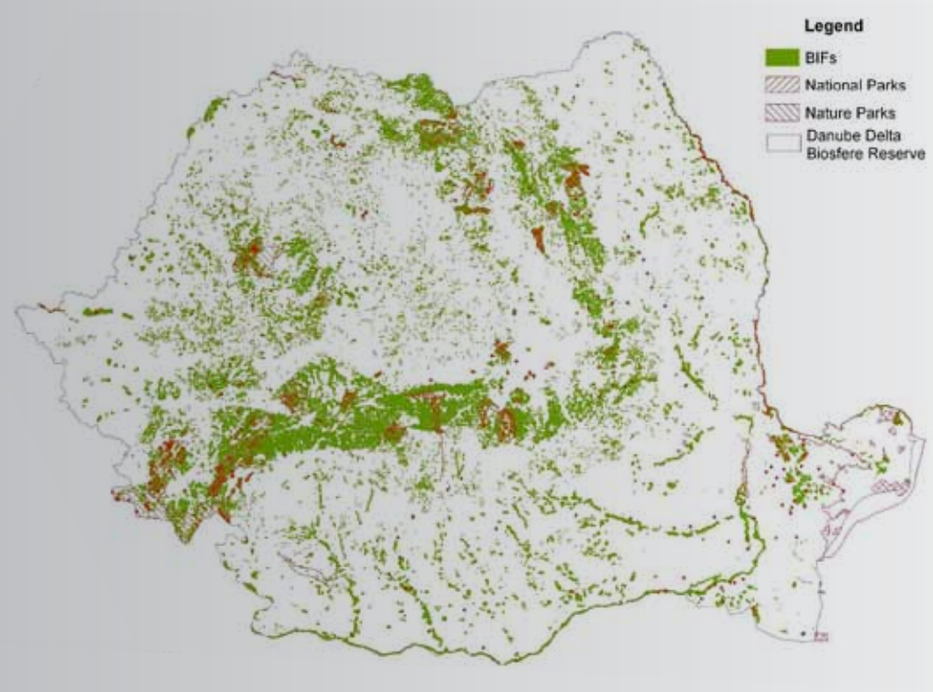


Fig. 17: BIFs in and outside of the protected areas network in Romania

The best protected BIF types in Bulgaria, with more than 60% of their extents lying within protected areas, include: Shrub vegetation of dwarf pine Pinus mugo, High oro-Mediterranean pine forest, Chestnut forest and Juniper forest, which are limited in geographical extent and located in regions where the protected area network is well developed. Eight BIF types are very poorly protected, with more than 80% of them extending outside protected areas. The least protected types are Turkey oak forests and Downy oak forests (more than 90% unprotected). More protected areas are needed to preserve the Riparian forests type as well, as only 1% of them are under strict protection and 16% under partial protection.

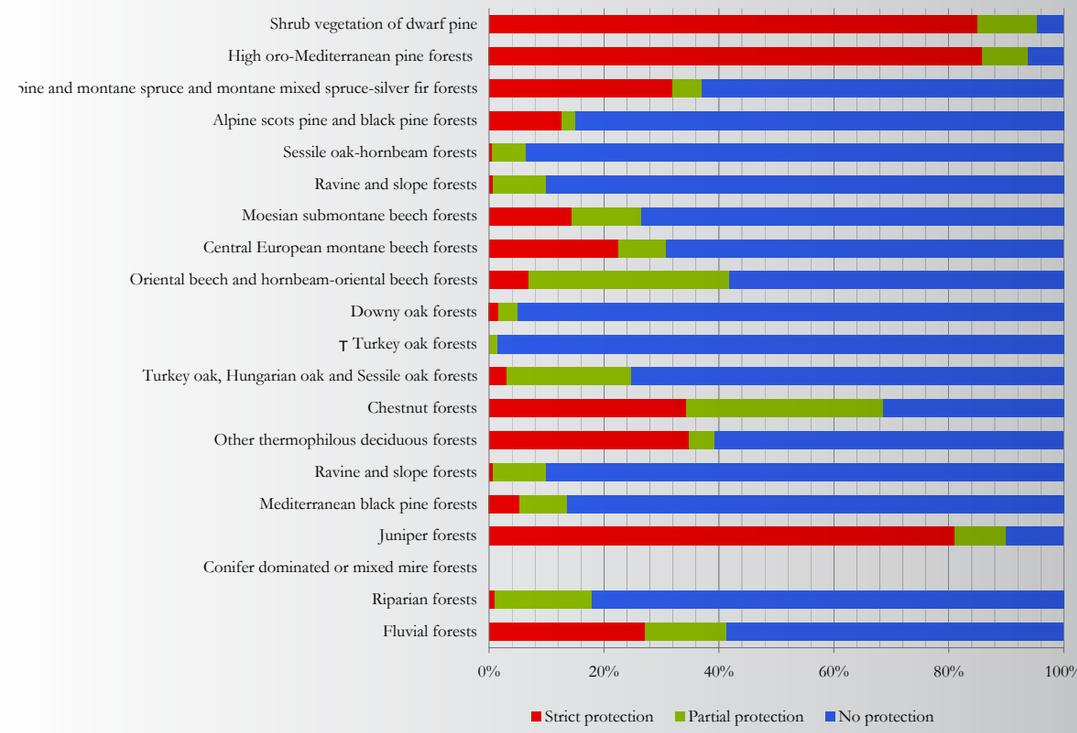


Fig. 18: Protection level distribution by BIF forest type in Bulgaria

In the Bulgarian protected areas network, those BIFs meeting the most criteria (five) are best represented, with more than 90% of these most valuable forests lying within protected areas (Fig. 19). Far less protected are those BIFs meeting two criteria, with nearly 90% of them completely unprotected. All BIFs satisfying even one criterion should be sustainably managed, yet over 95% of them have no protection at all.

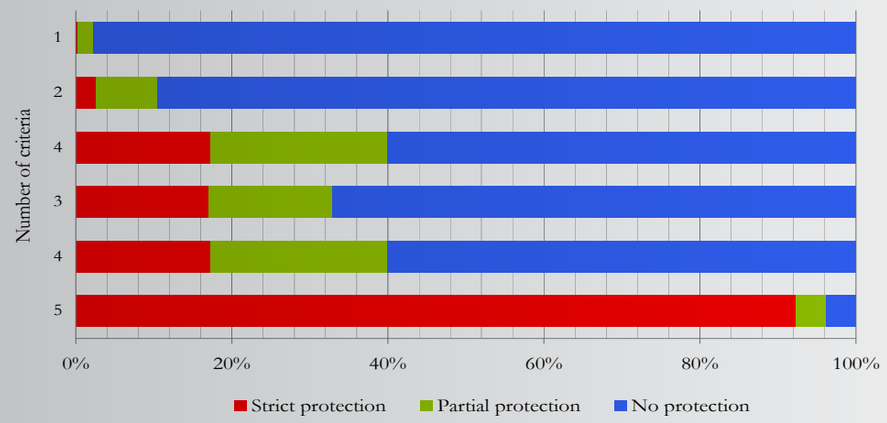


Fig.19: Level of protection of BIFs according to number of BIF criteria, Bulgaria

In Romania, the most strictly protected BIFs are in the North-western and Western regions, home to the highest concentrations of protected areas in Romania and large carnivores such as brown bear, wolf and lynx. Partially protected BIFs prevail in the North-Eastern and South-Eastern administrative regions (Fig.20).

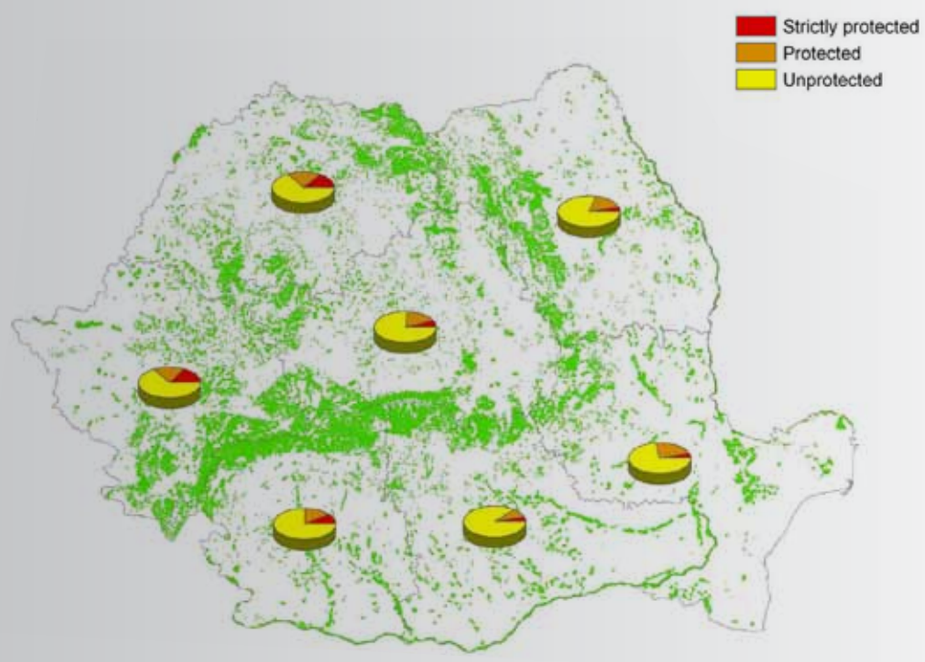


Fig. 20: Distribution of BIFs in BRFM protection categories in individual NUT3 administrative regions in Romania

Forests meeting Criterion 6 Critical concentration of species are best protected with 20% under strict protection and a further 31% with partial protection. This is due to frequent BIFs Criterion 6 overlapping with Important Bird Areas, which are covered by existing legal protection. As a large part of BIFs meeting Criterion 1 Forests with no or limited human activities are inside national protected areas, they are also well protected; 14% are under strict protection and a further 27% are partially protected. The least protected are forest meeting Criterion 4 Endangered forest ecosystems (approx. 90% are unprotected) and Criterion 5 Forests within floodplains, forest islands, specific forests on bogs (87% are unprotected) (Table 10).

Table 10: Protection of BIFs by individual BIF criterion in Romania

Criterion	Strictly protected %	Partially protected %	Unprotected %
Cr 1: Forests with no or limited human activities	14	27	59
Cr 2: Old growth forest	6	14	80
Cr 3: Considerable amount/long term continuum of dead wood	No data		
Cr 4: Endangered forest ecosystems and habitats	3	7	90
Cr 5: Forests within floodplains, forest islands, specific forests on bogs	1	12	87
Cr 6: Critical concentration of species	20	31	49
Cr 7: Forests that are habitats of endangered, rare and endemic forest dependent species of plants and animals	Insufficient data		
Cr 8: Forests where rare broadleaved and coniferous species are present	4	15	81zz

The best protected forest types are Boreal forest of spruce, larch, Swiss pine and Scots pine (18% strictly protected) and Mesophile forest of beech in mountain area (12% strictly protected)), again because these forest types tend to fall in the protected areas network and due to their location in steep mountainous areas with limited access. Less protected are Mesophile and thermophile forest of pedunculate oak (more than 65% outside protected areas) and Thermophile forests of Turkish oak and Hungarian oak (more than 66% of each is outside protected areas).

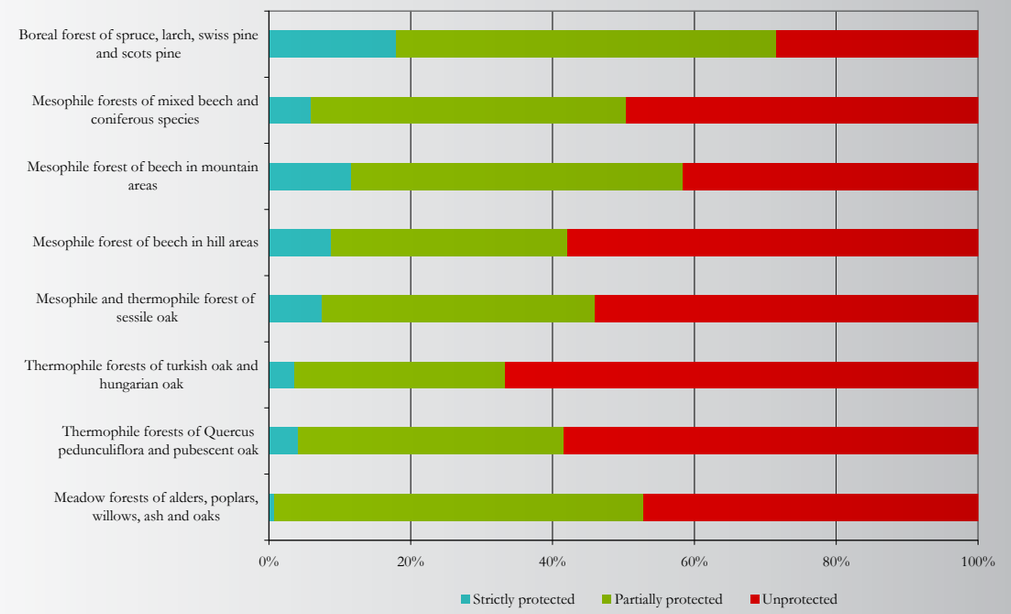


Fig. 21: Protection categories in individual forest types of BIFs in Romania

Overall analysis of BIFs and protected areas shows that the network of protected areas does not provide consistent protection across all forest types found in Bulgaria and Romania, and should be improved in order to better protect under-represented forest and BIF types. Ensuring that all forest types are afforded some type of protection will more efficiently and effectivey preserve Bulgaria and Romania's forest biodiversity.

3.6.2. BIFs and Natura 2000

The national Natura 2000 networks, whose establishment coincided with the accession of Bulgaria and Romania to the European Union, could also contribute to the protection and sustainable management of the forest ecosystems in both countries. Natura 2000 is an EU-wide ecological network consisting of protected sites that have been tasked to secure the long term preservation of the most important and vulnerable species and habitats in Europe in accordance with the main international treaties in the field of biodiversity and nature protection.

The Natura 2000 network includes two types of areas. Those which support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds) are approved as Site of Community Importance(SCI)[8] and then designated as Special Areas of Conservation (SAC). Areas which support significant numbers of wild birds and their habitats may be designated as Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are designated under the Birds Directive. The designation of SACs compared with the designation of SPAs is a more complicated and longer process requiring cooperation between the Commission and the Member States. Some especially biologically diverse areas may be both a SAC and a SPA.

At the moment in Bulgaria, 114 SPAs(covering 20% of the Bulgarian territory) and 252 SCIs (covering more than 30% of the country's territory) have been officially approved by the Council of Ministers. The total area of the Natura 2000 network in Bulgaria covers approximately one third of the Bulgarian territory. Natura 2000 sites were established by two Ministerial Orders of the Ministry of Environment of Romania. 108 SPA were declared (for 118 bird species) covering 12 % of the country surface and 273 SCIs covering 13% of the country surface. To date, 316 Natura 2000 sites covering 18% of the country's territory have been officially approved by the Romanian Government.

The Natura 2000 sites designated under the Habitats Directive cover 68.3% of the BIFs in Bulgaria (Fig. 22) and Natura 2000 sites under the Birds Directive cover 47.7% of the BIFs (Fig. 23). Seventy percent of BIFs are situated in Natura 2000 areas under one or both of the directives. BIFs which are not included in the Natura 2000 network are mainly those that were designated using criteria (e.g age and structure of forest stands) that are not linked to the Natura 2000 site selection criteria. The latterak tied to the presence of rare species or habitat types. Of the BIF criteria, only endangered vegetation types are linked closely with Natura 2000, because this criterion was based on the list of endangered forest habitat types from the Habitat Directive. However, large aggregations of forests that meet the criteria of the BRFM project provide potential conditions for the survival of rare and specialized forest-dependent species whose presence is one of the criteria for the selection of Natura 2000 sites. Because of this, the areas with the largest aggregations of BIFs identified during this project greatly overlap with Natura 2000 sites.

The current version of the Natura 2000 network in Bulgaria was greatly reduced in comparison to initial proposals and does not include a large part of the BIFs located in areas subject to greater investor interest in mountain areas and along the Black Sea coast. Furthermore, as the protection status of the majority of Natura 2000 sites is unclear due to the lack of management plans as well as, in most cases, absence of clear, rigorous and adequate restrictions in their designation ordinances, effective protection and sustainable use of BIFs within Natura 2000 remains an issue of concern.

8 See chapter VI. Clossary

Approximately 9% of the BIFs within the Natura 2000 network belong to municipalities or private owners: 5.9% of the identified BIFs in SPAs are municipal property and a further 2.2% are privately owned. The share of BIFs within the areas designated under the Habitats Directive is a bit higher - 6.1% are municipal and 2.8% are private forests. Their better management could be encouraged through compensatory mechanisms, one of the most important of which is the "Natura 2000 in forests" measure from the Bulgarian Rural Development Programme. This measure has not been developed and applied in Bulgaria yet, due to the delay in the establishment of Natura 2000 in Bulgaria, but it is due to start at the beginning of 2010.

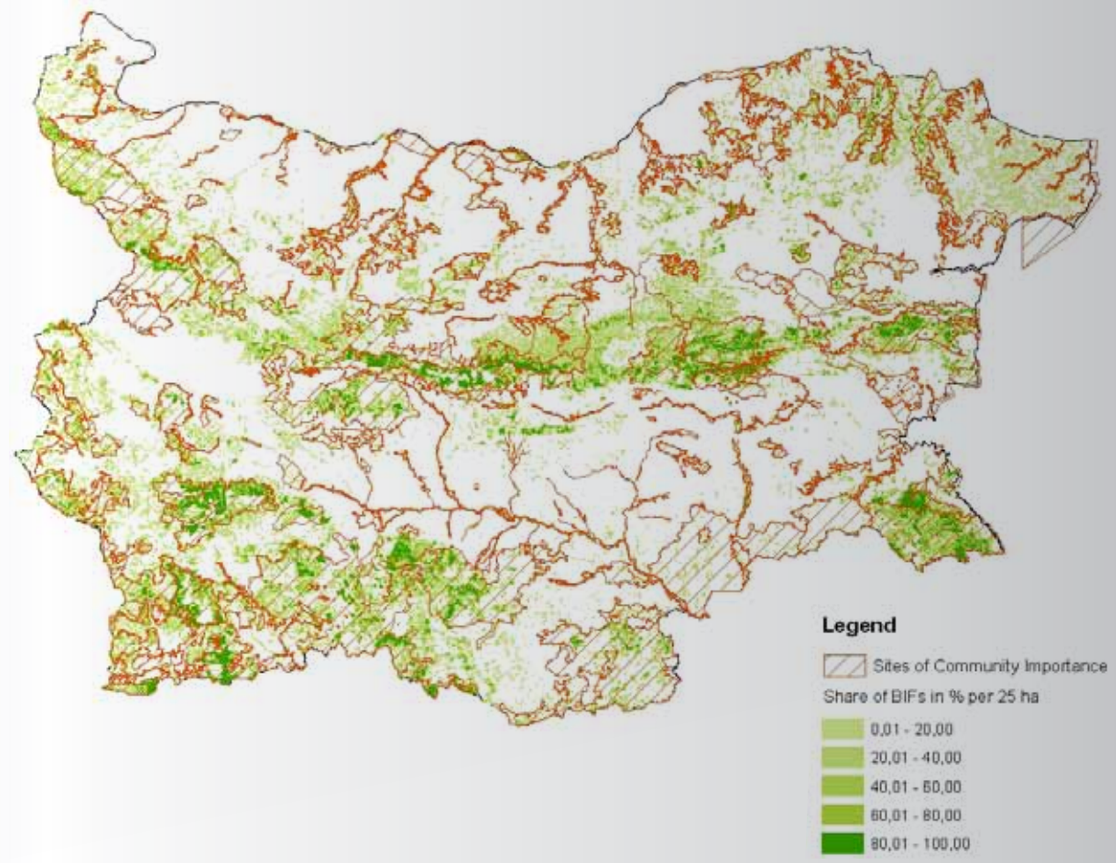


Fig. 22: BIFs and Natura 2000 Sites of Community Importance according to Habitat Directive in Bulgaria

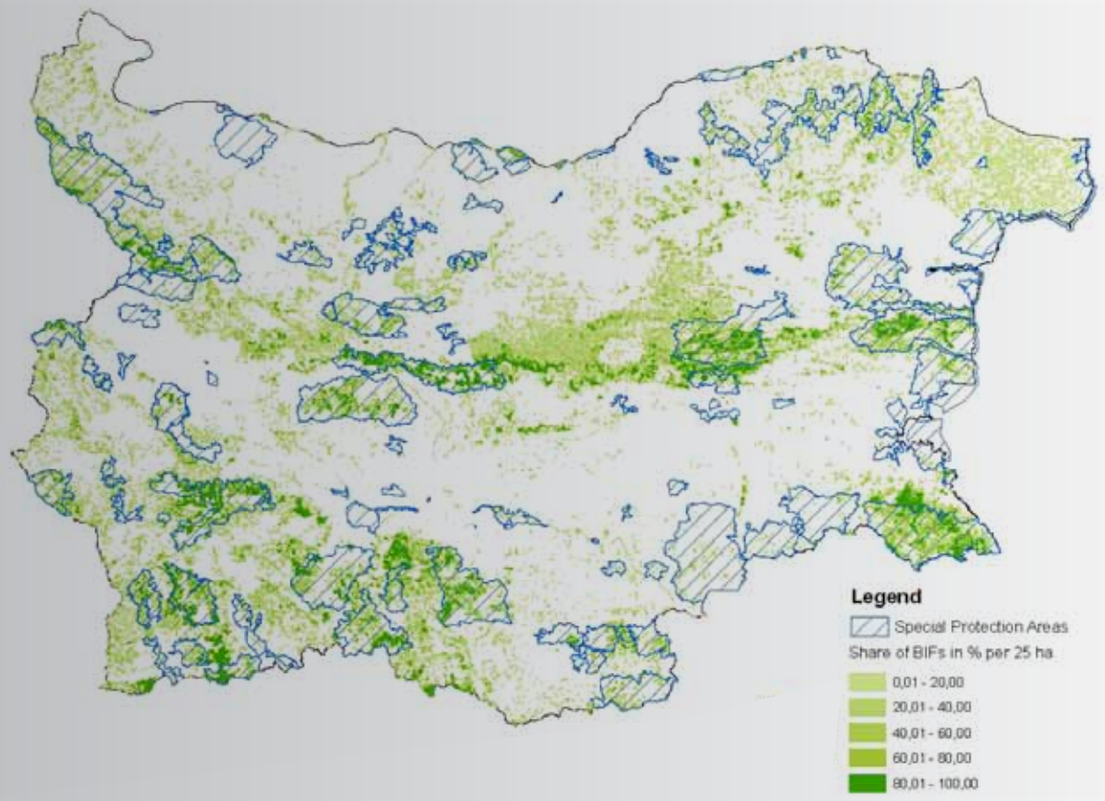


Fig. 23: BIFs and Natura 2000 Special Protected Areas according to the Bird Directive in Bulgaria

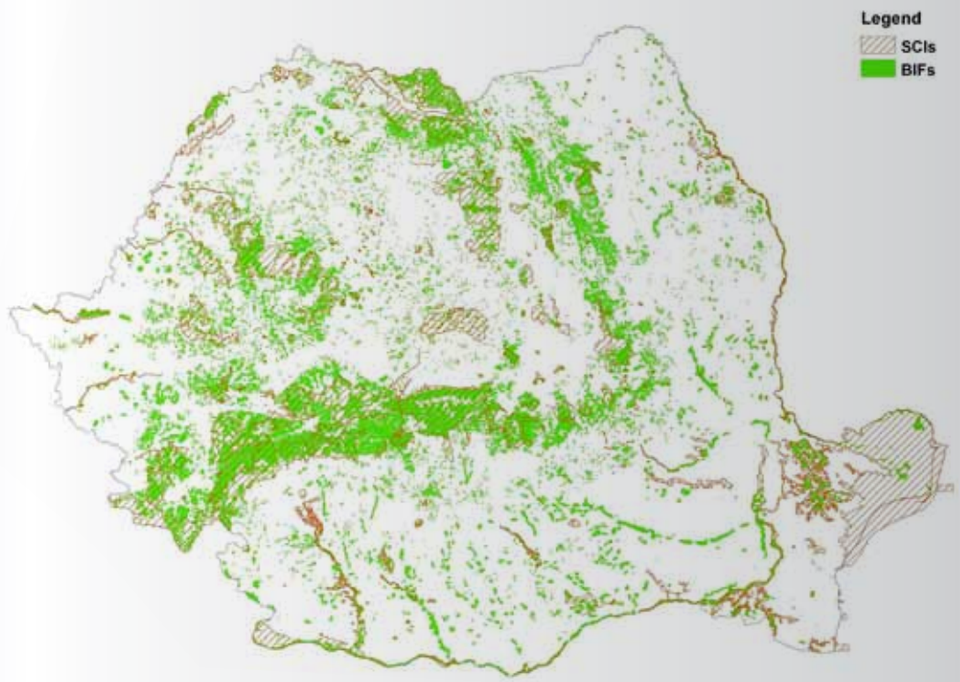


Fig. 24: BIFs and Natura 2000 Sites of Community Importance according to the Habitat Directives in Romania

Of the total BIFs identified, about 53% are inside the Romanian Natura 2000 network. This represents around 12% of the total forest cover at the national scale, leaving 50% of Romanian BIFs outside of the existing protected areas. About 23% of the total area of forest is included in Natura 2000. However, at present, the possibility of adding new areas to the Natura 2000 network is not very likely, also the procedures for protecting these areas under national protected schemes could take between 1-2 years. Most of the stakeholders are only interested in the commercial use of the forest, and are therefore very resistant to the idea of the new protected areas. On the other hand, in 2008 the new forest management guideline (so called Forest Code) was approved, with an obligation to complete new forest management rules within a year, howeer this process is still just beginning. At the moment, Natura 2000 does not confer any specific protection on designated sites, except for the cases where Natura 2000 sites cover preexisting protected areas, such as national parks. Currently most Natura 2000 sites do not have management plans.

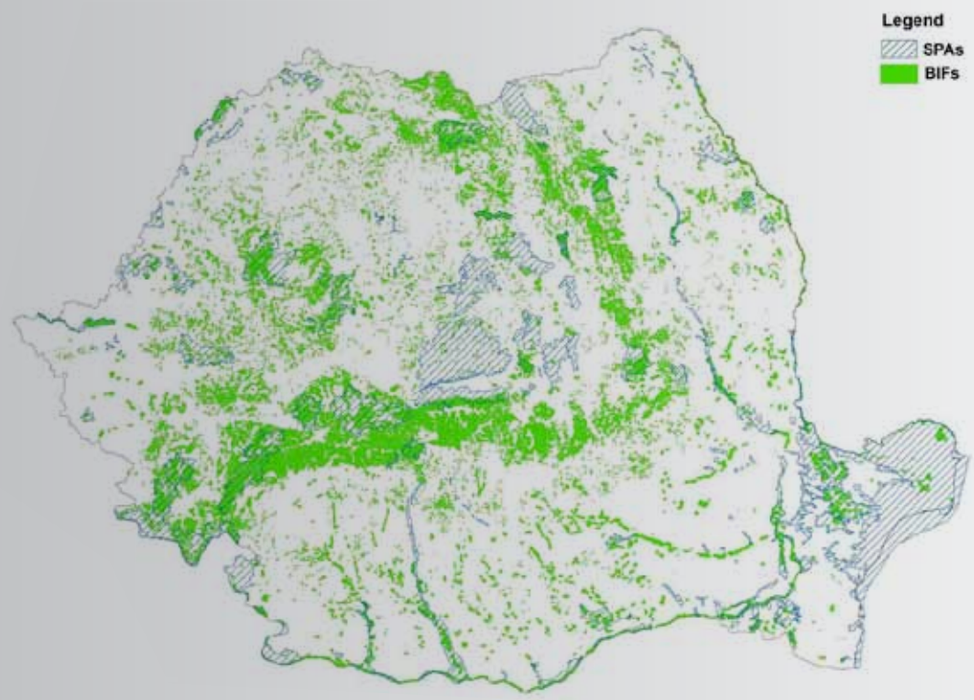


Fig. 25: BIFs and Natura 2000 Special Protected Areas according to Bird Directive in Romania

Regarding the inclusion of particular BIFs in the Romanian Natura 2000 network, BIFs meeting Criterion 6 Critical concentration of species are best represented with 88% included. Least represented are forests under Criterion 4 Endangered forest ecosystems and habitats and Criterion 8 Forests where rare broadleaved and coniferous species are present. This statistically proves that most local endangered habitats and rare species are not included under the Habitat Directive, and therefore are also missing from the Natura 2000 network.

Table 11: Shares of BIFs protected by the Romanian Natura 2000 network by criterion

Criterion	Percentage of BIFs inside Natura 2000	Percentage of BIFs outside Natura 2000
Cr 1: Forests with no or limited human activities	67	33
Cr 2: Old growth forest	41	59
Cr 3: Considerable amount/long term continuum of dead wood	insufficient data	
Cr 4: Endangered forest ecosystems and habitats	33	67
Cr 5: Forests within floodplains, forest islands, specific forests on bogs	50	50
Cr 6: Critical concentration of species	88	12
Cr 7: Forests that are habitats of endangered, rare and endemic forest dependent species of plants and animals	Insufficient data	
Cr 8: Forests where rare broadleaved and coniferous species are present	32	68

3.7. Field checks results

Field checks were conducted to verify the accuracy of the forest database. Being a basic check on fundamental variables such as tree species and stand age, these did not include detailed scientific studies of the sites' flora and fauna.

BIFs stands in Bulgaria are 153,000 in number. In order for field checks to have statistical meaning, 10% of BIF stands (15,300 stands) must be checked for verification. This was beyond the scope of the project. Thus, field investigations were focused in areas with BIF concentration in priority areas of the country and in this way they have a statistical meaning within these regions.

Field investigations took place in ten localities with high concentrations of BIFs, which were identified on the basis of preliminary analysis of the available data (Fig. 26). Theses localities covered the territory of fourteen forest and game districts, included 340 forest compartments and had a total area of approximately 900 ha. This was less than 0.1% of the total BIF area in the country.

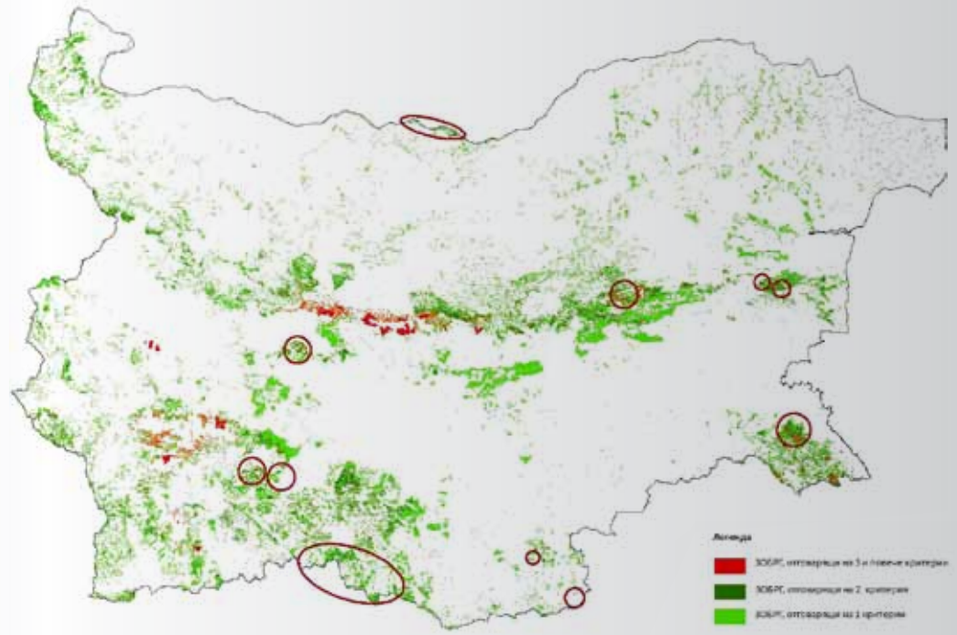


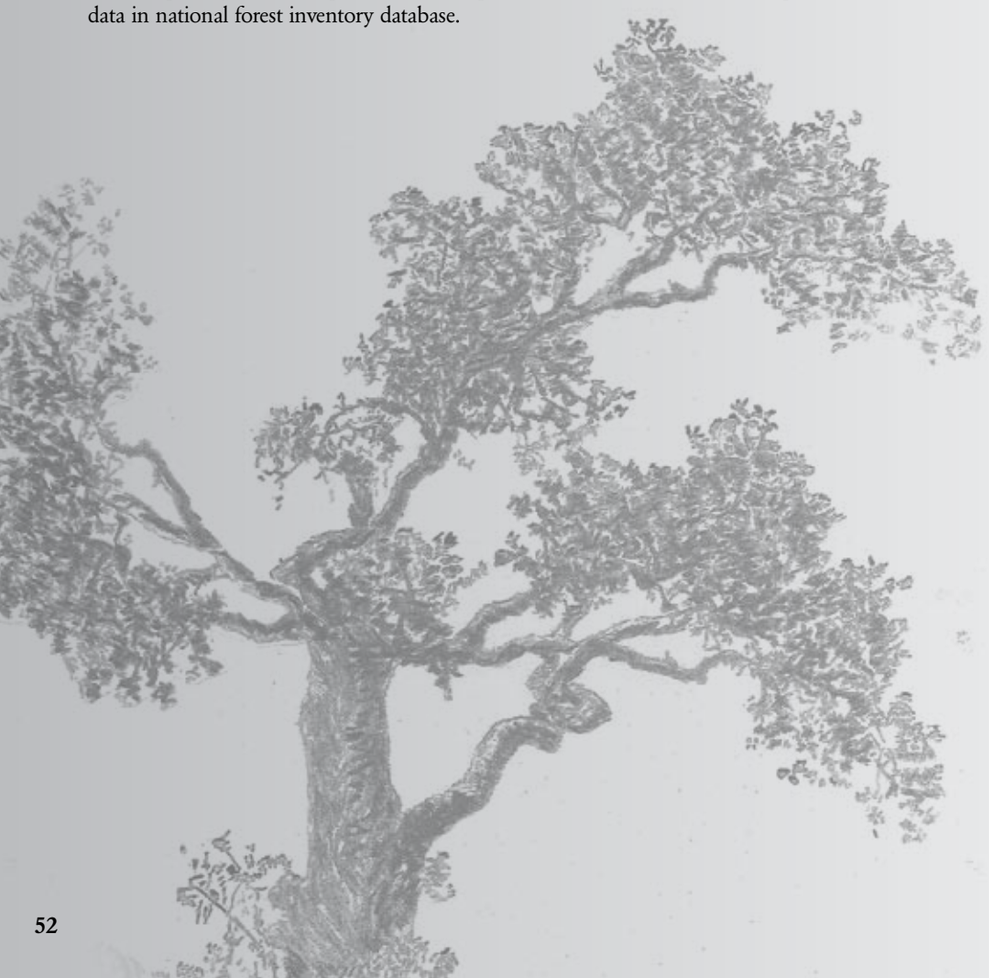
Fig. 26: Field checks locations in Bulgaria

The field investigation showed that error in the forestry database was greater for forest and game districts for which forest management plans were prepared more than five years ago. Often in such districts cuttings had been conducted in BIF stands, leading to, in some cases, loss of BIF characteristics. These changes are not always reflected in the forest database at a national level and therefore would have been impossible to be taken into consideration given the scope of this project.

Field investigations allowed us to draw some general conclusions about the reliability of the BIF database, particularly in regions with a high concentration of BIFs.

- The BIF database is relatively reliable for regions with high BIF concentrations;
- Larger errors in the data can be observed in forest and game districts in which forests have been devastated by forest fires in recent years (e.g. Eastern Rhodopope). Fires have destroyed many BIFs which have in many cases subsequently been reforested with non-native species;
- Many BIFs are located in the buffer zones of the reserves;
- Some of the most valuable and old BIFs were found in so called “seed production stands”. They are predominantly old forests, some of them including trees much older than their final cutting ages. Seed stands cover 3.5% of the total BIFs cover age in Bulgaria. Despite the high significance of seed production stands for the preservation of biological diversity and also for the preservation of the genetic diversity of tree species in Bulgaria, these stands are often unsustainably logged.
- A major sources of error was the inaccuracies in the delineation of borders between forest compartments on the digital maps.
- Six of the ten investigated localities are very rich in biodiversity and have the potential to be designated as protected areas.

Field investigations in Romanian were not possible due to long lasting process of digitalization of BIF data points (approximately 200,000 points) on the maps which was required. For that reason, it was not possible to estimate the approximate accuracy of data in national forest inventory database.



IV. DISSCUSION

4.1. Quality of source data and effect on results of this project

When evaluating project results, it is important to emphasize that the goal of the project was to gather landscape level, rather than stand level data. Regions with higher concentrations of BIFs have better chances of conserving forest biodiversity than others. As BIFs were selected based on several different criteria, they vary greatly in composition, structure, location, etc. However, the BIF types give more information on the biodiversity of different sites or indicate high potential to become biologically valuable over the next decades, if properely managed. Some BIF sites, including old-growth forests, may have poor diversity of composition, little deadwood, or no rare species. The probability of preserving high conservation values (or a potential to increase them in the near future) is much greater in extensive forests with large aggregations of BIFs than in ‘average’ wooded landscapes (BPFM report, 2007).

The reliability of the BRFM project’s results is directly dependent on the quality of the source data, mainly national forest inventory databases. Based on this, the major source of error in both countries may be the fact that some biologically valuable forests have been mistakenly ignored during the national inventories either because the forest management plans in Bulgaria and Romania are not designed to take account of the non-economic dimensions of forests or because the gathering of data on a particular criterion is not consistent across forest districts. Furthermore, the data likely contains flows, such as incorrectly recorded species or numerical data on various features of forest stands. Numerical errors in particular may lead to the erroneous classification or rejection of a plot as a BIF during a database query for a given criterion.

Another technical issue is that the forest inventory database itself is only partially up to date, as only about 10 % of the forests management plans are updated each year. As a result, on the national level there are different ages and reliabilities of information in the database. For example, indications in the data of quite recent changes such as logging were not available leaving a certain amount of uncertainty in our findings. Furthermore, there is currently no method for automatically updating BIF data. Some errors in Romanian mapping data were introduced due to inaccurately georeferenced maps used for point digitizing of data from the forest database. Such disparities do not significantly affect the results on Level 3 but should be considered when making analysis on the regional or local levels.

In addition, the Bulgarian and Romanian forest databases do not include information on ecological aspects of the forest environment (e.g. quantity and quality of dead wood, forest type, presence of endangered species) and have only occasional information on red-listed species of animals and plants which limits the application of some BIF criteria (e.g. Considerable amount/long term continuum of dead wood and Forests that are habitats of endangered, rare and endemic forest dependent species of plants and animals).

One should also consider the fact that a large percentage of the Romanian forests have been given back to former owners (private individuals, churches and municipal entities), although 66% are still the property of the state. As the restitution process was carried out during the past 15 years, the state also changed their managing authority several times during this period. As a consequence, while the (re-)privatization process was under way, the management of data from privatized forests was not updated in the National Forest Research and Management Institute database. The massive privatization took place between 2001 and 2007, and after the privatization of each stand, its information was no longer updated in the management database. So, up-to-date data for all private forests was lacking for the purpose of the BRFM project. Forest restitution is not completed, and for this reason some areas still have an uncertain status.

Another problem during the implementation of this project was the use of several data sources with differing details, for example, the deviation of digital boundaries of protected areas from digital boundaries of forest stands.

Lack of digital information for Level I and Level II in Romania hindered the analysis on these levels. Another challenge was the heterogeneity of the different spatial data sets (some as points, others as polygons), which made it impossible to calculate the overall surface of BIFs meeting a specific criterion at Level 3 (inside each square of 500 x 500 m of the grid). All calculations were conducted using overlapping forest data (from forestry database and other various sources) and Corine Land Cover data 2004.

Consequently, the results of this project cannot be regarded as an accurate source of information on the forest stand level. Precise locations of stands should be verified in the field when using the BIF database and maps. The conducted field investigations in Bulgaria showed that the BIFs database and BRFM results are comparatively reliable for regions with a high BIF concentration. The standard deviation allowed in the BIFs database was not to exceed 20%, and this deviation is significantly lower at Level 3, meaning that the maps drawn at this level can be used to determine tendencies in the distribution and the protection status of the forests with high nature value.

4.2. Application of BRFM database and maps

The BIF approach adds a new ecological aspect to the forest inventory database, which previously only catalogued economic attributes of the forest. Depiction of BIF distribution in Bulgaria and Romania through use of the user-friendly interactive on-line service will help decision makers understand the need for sensible planning and management on broad scales that take biodiversity into account. Landscape methods of modelling and GIS are still very limited in their application in the field of forest biodiversity conservation and management in Bulgaria and Romania. However, such methods can significantly contribute to the improvement of forest policy and maintain forest biodiversity in both countries.

4.2.1. BIF maps: A step towards a more coherent and representative protected areas networks in Bulgaria and Romania

Distribution maps of BIFs show that many BIFs are outside protected areas. A comparison of the coverage of the current protected area network in Bulgaria and Romania with the distribution of BIFs reveals aggregations of BIFs that are not currently protected (chapter 3.5.1.). By area, 25.2% of BIFs in Bulgaria and 26% in Romania are afforded some legal protection, although forests with no intervention at all or strict management for biodiversity account for only 10.4% of Bulgarian and 8% of Romanian BIFs. Since the area coverage of BIFs found during this project in Bulgaria was 23% and in Romania 22.5% of the forest area overall, this means that the amount of forest of biological importance set aside for biodiversity protection is approximately 3% of all forests in Bulgaria and 2% of all forests in Romania, numbers well below those recommended by recent ecological studies, which recommend a minimum of 10% (Hanski & Walsh, 2004).

Almost 70% of Bulgarian and 53% of Romanian BIFs are included in the Natura 2000 network (chapter 3.5.2.). The establishment of the Natura 2000 network in Bulgaria and Romania ironically led to strong neglect of the protected areas network. The position of the state institutions in both countries is that the Natura 2000 network has increased the amount of protected territories and therefore no further protected areas (in particular within Natura 2000) are needed. However, unless real protection is secured through Natura 2000 protection plans or existing national legislation, BIFs situated in Natura 2000 are "protected" in name only.

Most of the BIFs in Bulgaria and Romania are located in mountainous areas (the Balkan range, Pirin Mountain, the Rila-Rhodopes massif, the various cross-border mountains in Bulgaria and in the Carpathian massif in Romania). In some parts of the Carpathian Mountains, especially at high altitudes, these forests cover large continuous areas. This result is also supported by the results of the project entitled "Inventory and strategy for sustainable management and protection of Virgin Forests in Romania" in which the author writes, "more than 2/3 of the mapped virgin forests are located on very steep slopes: over 30 degrees. Only a quarter of the forests were located on slopes between 15-30 degrees and only 8% is situated on flat and nearly flat areas". These BIFs in mountainous areas, are among best protected BIFs types in both countries, excluding endangered forest habitats with a limited geographic extent. The BIF type Alpine coniferous forest has 50% legal protection (strict and partial) in Bulgaria. The best protected forest type in Romania is Boreal forest of spruce, larch, Swiss pine and Scots pine of which only 28.39% are unprotected. Conservation importance of mountain forests correlates to the richness of their fauna, flora and fungi as well as an abundance of species significant to conservation such as endemic species (Raev, I.& Veen, P., ed., 2005). In turn, principal factors predicting low human impact and therefore determining the survival of these BIFs are their relief, difficult access and the legal status of the territory. In recent years, these forests have been particularly impacted by the growing tourism industry and development in mountain areas, generally in Pirin and Rila mountains in Bulgaria and in Transsylvania in Romania.

BIF maps in Bulgaria and Romania show substantial deficiencies in the existing national protected areas networks regarding lowland forests. In plains regions, BIFs are usually small complexes, often isolated from each other, spread out across arable land or intensively harvested forests. These forests are essential to biodiversity conservation, since many of them have been destroyed by inappropriate grazing practices and illegal clearing due to their easier accessibility to humans.

Although the forest classification systems used in Bulgaria and Romania are different, a common pattern was observed: the network of protected areas is not representative for all types of forests that are found in both countries. Eight BIF types are very poorly represented in the Bulgarian network of protected areas. Although these forest types contain very rich biodiversity and are important for conservation; more than 80% of their extent lies outside protected areas. In Romania five BIF types are among the least protected with more than 54% of their extent outside protected areas. Some of the most valuable forest types identified as BIFs which are not represented in the national protected areas network are lowland and sub-montane oak dominated forest types. More protected areas are needed to preserve the forest types Riparian forests and Meadow forests of alders, poplars, willows, ash and oaks, as only 1% of them are under strict protection. These forests are among the most critical natural habitats while also being vulnerable to threats from human activities such as adjustment of river beds, regulation of water flows and water regime change of rivers, pollution and overexploitation. Therefore, riparian communities are in need of urgent measures for their protection, restoration and sustainable management.

Special attention should be paid to BIFs located near to protected areas, in buffer zones and BIFs situated in "seed production stands", as they show potential to extend protected areas and to create necessary ecological corridors.

Adequate protection of Biologically Important Forests in Bulgaria and Romania requires improving the national protected areas network in two aspects: (1) increasing the extent of protected areas and (2) improving the representation of currently underprotected forest types in the network.

Protected areas cover only about 5.1% of Bulgarian territory and about 5.2% of Romanian territory. Although the cornerstone of Bulgaria and Romania's biodiversity protection efforts are their networks of protected areas, we assert that adequate protection still has not been achieved. Establishing an ecologically representative and effectively managed network of forest protected areas is imperative for truly sustainable forest use. The BIF maps and databases in Bulgaria and Romania can help optimize conservation efforts in both countries. They are a practical tool for improving the protected area networks in Bulgaria and Romania and for conservation planning in general.

4.2.2. BRFM data and maps: Possible applications for scientific, educational and conservation purposes

BIF mapping data for Bulgaria and Romania provides data for spatial analysis for scientific and conservation purposes. GIS offers wide possibilities for analysis of the distribution of BIFs, their fragmentation, their distance from one another, and the location of biodiversity hotspots. Such analyses could possibly be used for planning the reintroduction of forest dependent species and suitable habitat prediction models for species. When one knows environmental requirements and the minimum forest patch size necessary for the survival of a stable population of a particular species, one can identify suitable reintroduction sites or propose biodiversity friendly forest management practices.

BIF maps offer potential guidance for the improvement of forest protection in Natura 2000 sites. Distribution maps of BIFs could become an important contribution to a more cohesive and focused conservation approach and can help to maintain or restore Favourable Conservation Status of forest habitats in the IBAs. Although forested IBAs play a crucial role for protecting vital bird populations, they generally contain a small number of individuals, as forest birds (and most other taxa) are dispersed. This means that healthy populations of most forest species depend on the quality of matrix habitats extending between IBAs. Favourable Conservation Status for forest birds can only be retained by a holistic conservation approach which envisions forests as dynamic systems composed of important biodiversity centres (such as national parks, Natura 2000 sites or areas with BIF concentrations) and appropriately managed matrix habitats. BIF maps and data could be used also for mapping habitats within IBAs, zoning or verifying IBA borders. Improved ecological modeling at the landscape level is needed to create and visualize a consistent model for forest policy, embracing both zones set aside for biodiversity and the network of functioning ecological corridors necessary to sustain biological values of European forests.

The BRFM database could be a basis for planning and incorporation of biodiversity protection into standard forest management practices. The BIF maps and database may be an important source of information to develop a map of areas with sensitive biodiversity and thus contribute to scientifically sound decision-making on the part of regional planner and alternative energy source developers. The BIF approach is an excellent tool for the assessment of the total number, type and location of forest land under HNV forestry and enables the design of successful conservation measures.

Photo 7: Semi-collared flycatcher (*Ficedula semitorquata*) is the only forest bird species in Bulgaria which is globally threatened, M.Gramatikov.

4.2.3. Practical application of BRFM results in Bulgaria

4.2.3.1. BRFM for identifying suitable habitats of the globally threatened semi-collared flycatcher in the Eastern Balkans

At present, BRFM data have already been used for identifying suitable habitats of the globally threatened semi-collared flycatcher in the Eastern Balkans. The semi-collared flycatcher (*Ficedula semitorquata*) is the only forest bird species common in Bulgaria which is globally threatened. Its global distribution comprises the Balkans, Anatolia and the Caucasus region. Information about the species is largely missing due to a lack of studies regarding it. Breeding habitats of the semi-collared flycatcher were studied since February 2009. The BIF database was used both in preliminary general assessment of the potential breeding habitats and for more precise location of the potential breeding forest patches larger than 3 ha.

The potential breeding habitats of semi-collared flycatcher were searched on the territory of Varna State Forest Directorate (situated in eastern Bulgaria) and the BIF database was first filtered the basis of following criteria and BIF types:
- BIF distribution on the territory of State Forestry Districts: Staro Oriahovo, located in the SFD Varna,
- BIF concentration: BIFs meeting 1, 2 and 3 criteria;
- Criterion 2: Average age of stand more than X years, where X is at least 20 years more than the commercial maturity species specific age, where age limits were specified between 100 and 180 years;
- Criterion 4: Forests with close to nature spatial structure;
- BIF forest types in the selected region:Thermophilous deciduous forest (Turkey oak, Hungarian oak and Sessile oak forest).

The second filter we created used the following parameters:
- height: 22-28 m;
- stocking rate: 0,5-0-8;
- diameter: 28-46 cm;
- size: >3 ha;
- share: 0,1-10;
- exposure: N, NE, E.

The selected BIFs were commercial forests, subjected to regular forestry practices. Research is still ongoing, but preliminary results show that most of the selected forest patches have breeding pairs of semi-collared flycatchers and their most often selected breeding sites are in:
- forests stands more than 100 years;
- forests with uneven canopy structure;
- forests containing very old trees from previous tree generations;
- forests on slope along small brooks.

Later on, these results will also be used in the development of the EU Single Species Action Plan for the semi-collared flycatcher, for which BSPB is the leading partner.

4.2.3.2. BRFM for identifying illegal logging in Bulgaria

The map of BIFs meeting Criterion 1 Forests with no or limited human activities will be used to develop an online monitoring system for illegal logging by the electronic information network of NGOs in Bulgaria – BlueLink. This project was initiated in response to massive corruption schemes and illegal logging in Bulgarian forests. The map of BIFs fulfilling this criterion will be used for an initial verification of alerts submitted by citizens, as in these forests human interventions are highly restricted.

4.2.4. BRFM database for forest certification

The FSC's definition of High Conservation Values encompasses not only exceptional or critical ecological attributes, but ecosystem services and social functions as well. Although narrower in scope than the HCVF concept, BIF distribution maps can contribute to HCVF identification in both countries. Carrying out a separate nationwide ground survey to inventory HCVFs is slow and expensive. Previously identified BIFs in Bulgaria and Romania can be easily adopted as a template for HCVFs in certified forest areas, as was done during FSC certification in Belarus.

The results of the forest mapping project may speed up the process of forest certification in Bulgaria and Romania. They can be used as guidelines for identifying HCVFs in forest and game districts. In Bulgaria, the State Forest Agency pledges to certify 30% of the state forests in next five years. By the end of 2005, some 1,100,700 ha of Romanian forest had been certified under the FSC System (Barbu, 2008).

4.3. Major conservation goals in Bulgaria and Romania identified in this project

The results and analysis of the BRFM project reveal that many conservation efforts are still needed to preserve the significant biodiversity in Bulgarian and Romanian forests. In order to maintain and enhance conservation values, conservation and management of Biologically Important Forests the following recommendations should be taken into account:

- The national protected areas network in both countries must be improved by increasing protected forest areas. Scientific studies show that to prevent species extinctions, at least 10% of forests should be set aside for biodiversity (Hanski & Walsh, 2004);
- The national protected area network must be improved to adequately represent underrepresented forest types, particularly lowland oak dominated forest types and riparian forests;
- In both countries, connectivity between core areas of biologically important protected and unprotected forests and existing protection area networks (including Natura 2000 network) must be ensured;
- Better management of BIFs requires incorporation of biodiversity protection measures into standard forest management practices (for example, sanitary logging in BIFs should be restricted);
- BIFs in seed production stands should be subject to special protection, the final phases of planned cuttings should not be conducted and at least 10% of their area should be left without any intervention;
- BIFs in buffer zones of protected areas should be subject to specially planned management;
- Better management of privately owned BIFs within the Natura 2000 network requires the development and application of compensations and especially the measure "Natura 2000 in forests" by the Bulgarian and RRD Programme;
- Construction of new infrastructure, such as forest roads to currently inaccessible BIFs, mainly virgin forests and "closed basins", must be restricted;
- Degraded biologically important forest ecosystems, habitats and populations of threatened species and ecosystems should be restored;
- Riparian communities are in need of urgent measures for their protection, restoration and sustainable management;
- Study of the dead wood inventory in different types of forests as well as in protected and managed forests must be designed and integrated into forest inventory programmes;
- Ecological attributes of the forest should be recorded and monitored in forest inventory programmes;
- Artificial reforestation with non-native species of BIFs after natural disturbances must be forbidden;
- BIFs in Bulgaria and Romania should be considered as a key component of Europe's wilderness landscapes.

A further, more in-depth analysis of BIFs is urgently needed in both Bulgaria and Romania for greater understanding of BIFs most in need of better protection and of areas where special management practices (including restoration management) should be applied.

4.4. Bulgarian-Romanian Forest Mapping: A contribution to the map of European BIFs and towards restoration of a trans-European forested mega-corridor

BirdLife International's BIF mapping programme, of which this project is a part, aims to assess forest conservation value on a continental scale. The application of uniform BIF criteria in all countries participating in the program, while being sufficiently flexible to take into account the specific environment of each country, make it possible to create a map of European BIFs. Such a map forms a basis for an integrated system of restoration, protection and management of forest ecosystems in Europe. The method applied in this project enables the map's adaptation to work with information systems used by forestry services, so that the information is easy to use in practical application. However, a detailed interpretation of the BIF criteria on a European scale needs to allow for possible differences among countries such as differences in source data, which require an individual approach in each country and may affect the local quality and reliability of results, but will not reflect on generalized Level 3.

The BIF maps and database make it possible to analyze the spatial distribution and diversity of BIFs, and to check how many and which criteria they meet. The data also enables the comparison of geographic or administrative units in respect of the potential conservation value of forests located within them. The data can be used to evaluate the current system of protected areas, to identify the additional potentially valuable areas and those important for conservation of trans-border forested areas.

The BRFM project results compliment previous ly compiled data on BIFs in Latvia, Estonia, Lithuania, Poland and Belarus. Now with Bulgarian and Romanian data on BIFs, seven countries in Europe are mapped. On average, 18% of each mapped country's forest cover has been identified as BIFs. Across mapped countries, 73% of all BIFs are without any protection, and less than 8% of BIFs are strictly protected.

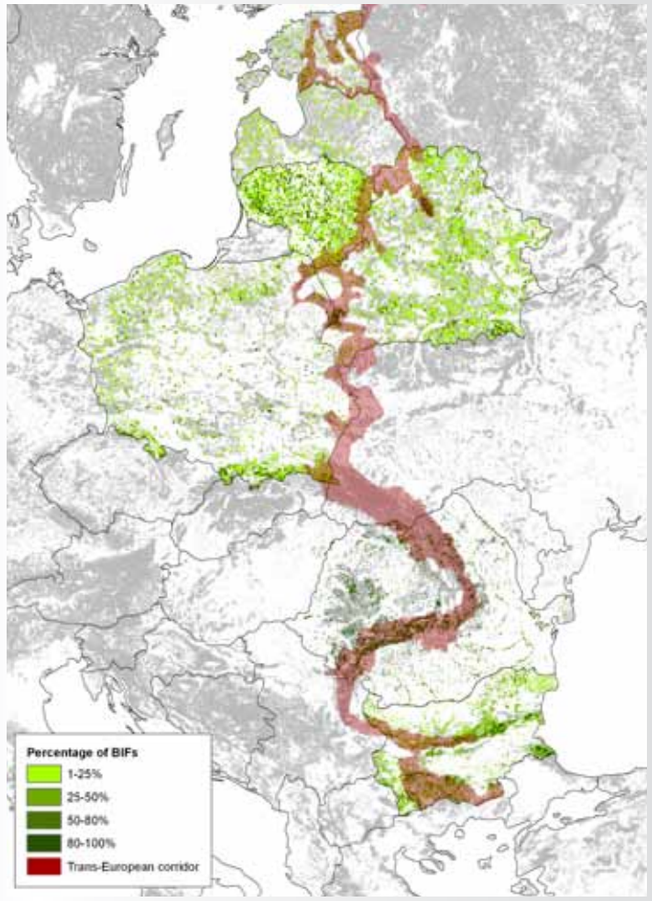


Fig.27: Map of potential trans European forest megacorridor

The next mapping project seeks to complete the knowledge of the location of BIFs in the EU eastern frontier by mapping the transition countries Hungary, Slovakia and West Ukraine which will bridge the two large already mapped regions comprised of the Baltic States, Poland and Belarus in the North and Romania and Bulgaria in the South. Harmonization of the recently developed Greek database of High Nature Value Forests with BIF criteria will complete the map. As a result, a real picture of the potential trans-European forested mega-corridor connecting the Boreal and Mediterranean regions will emerge. Large functioning corridors are critical to alleviate the impact of climate change on biodiversity in Europe, save species from extinction and gene pool degradation and ensure the continuation of ecosystem services that forests provide for humans. Preservation of all remnants of natural forests and restoration of the ecological connectivity bridging forest biodiversity centres along the EU's eastern frontier in a trans-European forest mega-corridor will be fundamental to securing Europe's natural forest heritage. These forests still provide refuges for many vulnerable species that have already disappeared in Western Europe; therefore, the region deserves the full attention and care of all Europe.

4.5. BIFs in Europe a key component of Europe's Wild landscapes

An initiative to promote the conservation of wilderness and large natural habitat areas in Europe was launched in 2008; BirdLife International became one of the first international nature conservation NGOs to endorse it. European Parliament adopted in January 2009 a Report on Wilderness in Europe that calls on the European Commission and the Member States to define, map and protect wilderness areas and specifically on the Commission to develop an EU Wilderness Strategy.

Europe is not rich in true wilderness yet, due to demographic trends, growing urbanization and climate change, it may see an increase in forested and agriculture lands being intensively used. The great majority of European wilderness areas are mountainous forests, as forests are the climax vegetation type across most of Europe and human impacts have been less severe in high mountains. This trend was re-confirmed by the results of the BRFM project. Most BIFs in Bulgaria and Romania are located in mountainous areas and most preserved large continuous forested areas are situated in high altitudes and on steep terrains. The conspicuous richness of forests of Bulgaria and Romania is also the result of a harmonious co-existence of traditional rural cultures with nature. Large carnivours, which have a sizable population in Bulgaria and Romania, are a moving symbol of the battle to save Eastern Europe's large forests from going the same way as those in Western Europe (Carpathian Ecoregion Initiative, WWF, 2001).

Wilderness is defined as a large area of terrestrial or marine natural habitat and its typical ecological processes and biodiversity, which is substantially unaltered by man. Data, including spatial information about existing wilderness areas and areas with high potential for wilderness restoration is insufficient. BirdLife International has contributed by mapping BIFs and by helping to characterize HNV Farmlands. The BIFs of the Baltic States, Central Europe and the Balkans should be considered key components of European wilderness, and the BIF mapping approach should be used to map remaining wilderness areas and areas of high potential for wilderness restoration. The preservation of wilderness areas in the EU should start with the provision of effective and permanent protection of the last remnants of true wilderness on the continent, using relevant categories of protected areas at the national and international levels. In addition, existing and potential wilderness areas need to be integrated into relevant spatial plans and sectoral policies at the appropriate level. The BRFM project and BIF mapping programme are important steps towards accomplishing these goals, but much work remains in order to fulfill the vision eternally protected extensive wilderness in Europe.

Photo 8: Wildereness area in Bulgaria, V. Ferdinandova

APPENDIX

Annex 1: General outline: characteristics, management, and protection of forests

BULGARIA

1) Major characteristics of Bulgarian forests

The Bulgarian forest fund[9] amounts to 4.1 million ha and comprises up to 34% of the country's territory, but only 3.65 million ha (89.7%) of the 4.1 million ha is actually wooded . The rest, nearly 10% of the whole area, is non-wooded land; this consists of forest roads, nurseries, mountain pastures, rocky areas, rivers, etc. Most of the forests are located in the mountainous (ca 80% of the Bulgarian forests) and semi-mountainous areas (Yonov & Velichkov 2004). There is a trend of gradually increasing the forest cover in Bulgaria. Forest cover is expanding mainly through afforestation and natural succession taking place in abandoned agricultural lands which are mostly municipality and privately owned. The forests in Bulgaria are divided into three groups, according to their main purpose:

1. Wood-producing and environment-sustaining forests (68.1%)
2. Protective and recreational forests (23.7%)
3. Forests and lands in protected areas (8.2%).

Broadleaved forests (mainly oaks and beech) dominate with 70.4% of all forest area. Coniferous forests (represented mainly by Scots pine, Austrian pine and Norway spruce) occupy only 29.6% of the area. Most of the forests are young; the average age of forests is ca. 51 years, but the range is very wide. Plantations occupy 26.6% of forested territory (RDP 2007-2013).

2) Government forest policy and legislation

The national legislative framework consists of specific forestry laws (Forest Act) and secondary legislation (e.g. Ordinance No. 6 for forest and game management planning) and other laws of relevance to forests (e.g. Protected Areas Act, Biodiversity Act), programmes, action plans (e.g. Strategic Plan for Forest Sector Development 2007–2011), projects and decrees of the Council of Ministers (e.g. Decree on ban of the trade of burned timber).

3) Forest management structure and harvesting rate

Management of state forests and the control of all forests are the responsibility of the State Forestry Agency (SFA). The SFA is a nationally budgeted administration with three level structures. The regional and local structures of SFA are the 16 Regional Forest Directorates, more than 150 State Forest and Game Districts, 11 Nature park directorates, and different research, seed control, and other stations and sections.

The total annual increment reached 14 million m^3 in 2005. The average harvesting volume according to the official data for the period 1996 - 2006 was 5.2 million m^3/a. Industrial harvesting, representing 73 % of the total amount, and cuttings by local population 23 %.

Bulgaria has a significant non-timber forest resource – medicinal plants, mushrooms, forest fruits etc. About 85% of the country's territory is assigned for hunting, with both hunting and fishing being of growing interest to the public.

4) Forest biodiversity and its conservation status

Bulgarian forests play an important role in preserving over 60% of the country's priority habitats; over 80% of the protected plant species; and over 60% of the endangered animal species. They are home to populations of 43 of the world's endangered species; and they comprise eight of the twelve landscape complexes which were defined in the national strategy for preservation of biodiversity as unique and representative of Bulgarian biodiversity. The populations of 43 endangered species are dependant on Bulgarian forest habitats and their protection depends entirely on the proper forest management.

In order to protect this diversity, 3 National Parks, 11 Nature Parks, 55 reserves and 35 maintained reserves have been established (SPFSD 2007–2011). The total area of the protected areas in Bulgaria comprise 580,935 ha which is 5.1% of the country's territory (MoEW 2008). Approximately 75% of Bulgarian forest protected areas are within the forest fund. Strictly protected forest areas (reserves, national parks and maintained reserves) cover less than 5% of the forest area (Rafailov et al. 2003). Managing authorities for protected areas are divided between the Ministry of Environment and Water (responsible for the management of national parks, reserves and maintained reserves which are exclusive state property) and the SFA.

9 According to the Forest Act "forest fund" is each territory out of the boarders of a settlement, intended mainly for forests, comprising of forests and shrubs as well as lands designated for afforestation and unproductive forest lands, as mentioned in the land cadastre. MAF 2006 data is used for the analysis in this section.

Table 12: Protected areas' categories in Bulgaria

	Category	Purpose	Ownership
1	Reserve	Protection of model natural ecosystems without human interference; monitoring of environmental processes	Exclusive state property
2	National park	Protection of ecosystems rich in biodiversity; only educational activities and sustainable tourism allowed	Exclusive state property
3	Natural monument	Protection of special landscape features (rocks, caves, waterfalls etc.)	Different property
4	Maintained reserve	Protection of ecosystems through maintenance and restoration	Exclusive state property
5	Nature park	Protection of the ecosystem, biological and landscape diversity; sustainable use of the natural resources and sustainable tourism activities allowed	Various ownership (state, communal, private etc.)
6	Protected site	Habitat protection of plants, animal and the landscape	Different property

The national Natura 2000 network covers approximately one third of the Bulgarian territory. The main requisitions of both directives are transposed in the Bulgarian legislation through the Biodiversity Act established in 2002. According to the Biodiversity Act, the Ministry of Environment and Water will officially designate the approved sites under the both directives. The process has already started for the SPAs and will come to an end soon. The orders for the SACs will be issued in 2009.

ROMANIA

1) Major characteristics of the Romanian forests

Romanian forest covers about 6,567,000 ha of Romania (27.65% of Romania's land area). Of these, 6,161,000 ha are actually wooded, the other 400,000 ha being meadows, marshes, and ponds. Most of the forests are situated in the Carpathian Mountains, at altitudes above 700 m (58.5%). The rest of forests are located in hills and plateaus between 150-700 m of elevation (32.7%), with only 8.8% located at altitudes below 150 m. Conifers comprise 30.3% of all Romanian wooded areas. Spruce (*Picea*) are the dominant coniferous species, followed by fir (*Abies*). Deciduous trees are best represented by beech (*Fagus*), which are the dominant tree species in Romania at 31.5%, followed by oak (*Quercus)* trees at 18%.

Romania has about 220,000 ha of virgin or quasi-virgin forests (representing around 6.5% of the total forested area), of which 99% are located in mountain areas. Despite this, virgin forest have diminished steadily during the last century from around 700,000 ha in 1948, to 600,000 ha in 1974 and 400,000 ha in 1984. Over 68% of forests are of natural type, corresponding to the native vegetation type. This proportion stayed relatively constant during the last 20-30 years, but presently there is a slight increase in the percentage of artificial forests. In the recent years, the total forest cover remained relatively constant, with a slight increase due to reforestation programmes.

Around 66% of the total forest area is state property. Regarding the age of the forests in Romania, around 25 % are 80 years old and more (with around 15% 100+). As much as 23% of forest area consists of 1 to 20-year-old stands. All Romanian forests are divided in two functional groups: special protection forests (52.1%) and production and protection forests (47.9%). According to forestry regulation, intensive silviculture management practices in the first functional category are restricted. Over 50% of the forests are preserved under a special management requirement, being included either as protective forests for water, land or soil protection, protection against climatic or industrial noxious factors, or for recreation or biodiversity conservation.

2) Government forest policy and legislation

In Romania the management of all forests (public or private) is done according to the Forest Code (Law 46/2008).

Other important legislation acts that affect environment protection and forestry practices are:

- Environmental Protection Regulation, No. 164 from 2008 – concerning issues related to environment protection;
- Hunting Regulation, No. 1092 from 2008 – concerning game protection and management;
- Regulation No. 606 from 2008 – concerning timber harvesting regulations;
- Regulation No. 635 from 2002 – concerning general management practices, timber harvesting regulations.

3) Forest management and forest certification

Timber harvesting has increased slightly in Romania during the last 20 years. This has resulted in an overall decrease in stand age. Following the European trend in forest certification, in June 2003, the National Working Group on Forest Certification was founded, with several major stake holder groups represented in the forest certification (e.g State institutions involved in forest management, such as Romsilva and National Forest Research and Management Institute, environmental NGOs, such as WWF, economical entities, Universities and private persons).

4) Forest biodiversity and its conservation status

Romania lies at the geographic centre of Europe and includes five of the ten biogeographic regions officially recognized by the EU: alpine, continental, panonic, pontic (euxinic), and steppe. Two of the biogeographic regions (steppe and pontic) are present only in Romania and not elsewhere in the EU. Thus, Romania has the greatest biogeographic diversity in the EU countries.

The natural integrity of Romanian forest ecosystems is indicated by the presence of the full range of European forest fauna, including 40% of all European brown bears, 30% of wolves, and 25-30% of lynx. The proportion of forests included in protected areas increased constantly, reaching almost 700,000 ha in 2005, of which over 200,000 strictly protected (included in special protection areas).

As of 2004, Romania had designated 963 protected areas, covering 7% of the country's area, however most were parks only on paper without an administration in place. Several Important Plant Areas already have international recognition, 5 from the Ramsar Convention and 5 are Biosphere Reserves. The National Development Plan 2007-2013 establishes a target to protect 15% of the country by the end of 2013 in order to comply with European Union requirements. Romania is also using the European bioregions in the establishment of the Natura 2000 protected areas network. Several large-scale projects are currently underway such as the Carpathian Mountains network of protected areas and the Green Danube Corridor.

Table 13: Protected areas' categories in Romania

	Category	Purpose	IVCN Category
1	Scientific reserve	Protection of model natural ecosystems without human interference; monitoring of environmental processes	I
2	National park	Protection of ecosystems rich in biodiversity; only educational activities and sustainable tourism allowed	II
3	Natural monument	Protection of special landscape features (rocks, caves, waterfalls etc.)	III
4	Maintained reserve	Protection of ecosystems through maintenance and restoration	IV
5	Landscape reserve	Protection of the ecosystem, biological and landscape diversity; sustainable use of the nature resources and sustainable tourism activities allowed	V

Annex 2: List of threatened, endangered or endemic ecosystems in Bulgaria

	Name	Habitat type according to Council Directive 92/43/EEC	EUNIS code	Code according to the EEA European Forest Types nomenclature
1	*Luzulo-Fagetum* beech forests	9110	G1.61	7.2
2	*Asperulo-Fagetum* beech forests	9130	G1.63	7.2
3	Medio-European limestone beech forests of the *Cephalanthero-Fagion*	9150	G1.66	7.2
4	*Galio-Carpinetum* oak-hornbeam forests	9170	G1.A16	5.2
5	* Tilio-Acerion forests of slopes, screes and ravines	9180 *	G1.A4(5)	5.8
6	* *Bog woodland*	91D0 *[10]	G3.E	11.1
7	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Pandion, Alnion incanae, Salicion albae)*	91E0 *	G1.1	12.2
8	Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*)	91F0	G1.2	12.2
9	* Pannonic woods with *Quercus petraea and Carpinus betulus*	91G0 *	G1.A1B	5.2
10	* Pannonian woods with *Quercus pubescens*	91H0 *	G1.7374	8.1
11	* Euro-Siberian steppic woods with *Quercus spp.*	91I0 *	G1.7A1	8.1
12	Pannonian-Balkanic Turkey oak- sessile oak forests	91M0	G1.769	8.2
13	* Western Pontic *Fagus forests*	91S0 *	G1.6E	7.8
14	Moesian *Fagus forests*	91W0	G1.69	6.7
15	Moesian *Tilia tomentosa* woods	91Z0	G1.7C4	8.8
16	* Eastern *Quesrcus pubescens* woods	91AA	G1.76	8.1
17	Moesian *Abies alba* forests	91BA	G3.16	3.2
18	Rhodopide and Balkan Range *Pinus sylvestris* forests	91CA	G3.4C	3.3
19	*Castanea sativa* woods	9260	G1.7D	8.7
20	*Hellenic beech* forests with *Abies borisii-regis*	9270	G1.6A	3.2
21	*Salix alba and Populus alba* galleries	92A0	G1.31	12.1
22	*Platanus orientalis* and *Liquidambar orientalis* woods (*Plantanion orientalis*)	92C0	G1.38	12.1
23	Acidophilous Picea forests of the montane to alpine levels (*Vaccinio-Piceetea*)	9410	G3.1	3.2
24	* (Sub-)Mediterranean pine forests with endemic black pines	9530 *	G3.5	10.2
25	* Endemic forests with *Juniperus spp.*	9560 *	G3.93	10.7
26	*High oro-Mediterranean pine* forests	95A0	G3.6	3.1.2.
27	Bushes with *Pinus mugo*	4070	F2.4(8)	3.1.1.
28	*Thermophilous Acer* woods	–	G1.7C34	8.8
29	*Hercynio-Alpine Betula* woods	–	G1.913	5.9
30	*Ostrya carpinifolia* woods	–	G1.7C1	8.8
31	Mixed non-riverine deciduous and coniferous woodlands	–	G4.8(3)	8.8
32	*Aesculus hippocastanum* forests	–	G1.7(E)	8.8
33	*Cercis siliquastrum* forests	–	G1.7(F)	8.8

* marks the priority habitats according to Council Directive 92/43/EEC

GLOSSARY

Important Bird Area (IBA) is an area critical for the existence of naturally occurring bird species of conservation concern. The selection of IBAs has been a particularly effective way of identifying conservation priorities. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network. They do one (or more) of three things:

- Hold significant numbers of one or more globally threatened species
- Are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species
- Have exceptionally large numbers of migratory or congregatory species

The IBA concept was developed by BirdLife International whose national partners campaign for recognising IBAs as Special Protected Areas (SPAs), together with Special Areas of Conservation (SACs) formal prerequisites for the establishment of NATURA 2000 sites.

Important Plant Areas (IPAs) are the best sites for wild plants and fungi. They provide the framework for the implementation of Target 5 of the Convention on Biological Diversity's Global Strategy for Plant Conservation.

High Conservation Value Forests (HCVF) - the concept of High Conservation Value Forests was developed by the Forest Stewardship Council in 1999, which treats the identification of HCVFs as one of the key conditions of principles and criteria for sustainable forest management (Principle 9 of FSC Principles and Criteria). The FSC's definition of HCVFs:

- **HCV1** Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).
- **HCV2** Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
- **HCV3** Forest areas that are in or contain rare, threatened or endangered ecosystems.
- **HCV4** Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).
- **HCV5** Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).
- **HCV6** Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

High Nature Value Forests (HNV Forests), defined in the Guidance Document to Member States (IEEP et al., 2007), are all natural forests and those semi-natural forests in Europe where the management (historical or present) supports a high diversity of native species and habitats, and/or those forests which support the presence of species of European, and/or national, and/or regional conservation concern. For HNV forests member states need to classify them into three main categories: naturally dynamic, semi-natural and plantations.

Matrix (habitat/environmental matrix) - "Habitat" = core habitat = suitable habitat, where the species can persist and breed successfully. "Matrix habitat" = habitat into which the species will venture and in which it can to some extent disperse. This also contains smaller patches of true "habitat", but these are generally not large enough or of high enough quality to allow long term persistence or guarantee successful breeding.

Prime Butterfly Areas (PBAs) are an initial selection of important butterfly areas in Europe, focussing on target species that are conservation priorities across this large and diverse region.

Site of Community Importance (SCI) is defined in the European Commission Habitats Directive (92/43/EEC) as a site which, in the biogeographical region or regions to which it belongs, contributes significantly to the maintenance or restoration at a favourable conservation status of a natural habitat type or of a species and may also contribute significantly to the coherence of Natura 2000, and/or contributes significantly to the maintenance of biological diversity within the biogeographic region or regions concerned. List of national SCIs is proposed to the Commission by the State Members and once approved, thay can be designed as SACs by that State Members.

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БЪЛГАРСКО ДРУЖЕСТВО ЗА ЗАЩИТА НА ПТИЦИТЕ
БДЗП

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