

COST Action E27

Protected Forest Areas in Europe – Analysis and Harmonisation (PROFOR)

Country Report - Belgium

Working Group 1 – Task 1.1.
Description of the historical background that has
led to the development of particular national Protected Forest Area frameworks

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Abstract. In Belgium, the first official initiatives for forest protection for biodiversity conservation and scientific purposes date back to the Law for Nature Protection of 1973, that defines two legal protection types: nature and forest reserves. While the rate of designation has been very low during the seventies and the eighties, it strongly increased after the federalisation of forest and nature management. The designation rate has been particularly high in Flanders where important financial means were allocated to protect the last remnants of semi-natural forests. Today, protected forest areas cover about 6,000 ha in Flanders (4.1 % of forest cover) and 3,000 ha in Wallonia (0.6 % of forest cover). This network still needs extension in the near future to fulfil representativity and connectivity objectives.

Any views or opinions expressed in this document are those of the authors and not necessarily those of any official body within the signatory states.

Keywords: Belgium, forest reserves, nature reserves, protected forest areas

1. Introduction

Belgium is a federal state consisting of three regions (Brussels, Flanders and Wallonia) and three communities (Dutch, French and German) (Fig. 1). The regions are responsible for almost all issues dealing with the environment, including forests. Hence, apart from the introductory sections, all other chapters in this report describe the situation in Flanders and Wallonia in separate paragraphs. Less attention has been paid to the Brussels region since it is a very small area almost entirely dominated by the city of Brussels.

Nowadays forest covers over 600,000 ha and almost all forests are managed as high forest. Forest covers about 9 % of the total area in Flanders and up to 32 % in Wallonia. An important reason for this difference is the higher degree of soil fertility, urbanization and industrialization in Flanders.

About half of the forest area in Belgium comprises mixed semi-natural broadleaved forests dominated by oak or beech trees. The other half is made up of various plantations, mainly Norway Spruce, Scots Pine and poplars (see Table 1). Of the broad-leaved stands at least 30 % are considered to be 'ancient woodlands' that have never been transformed to other land uses (De Keersmaecker et al. 2001). Despite

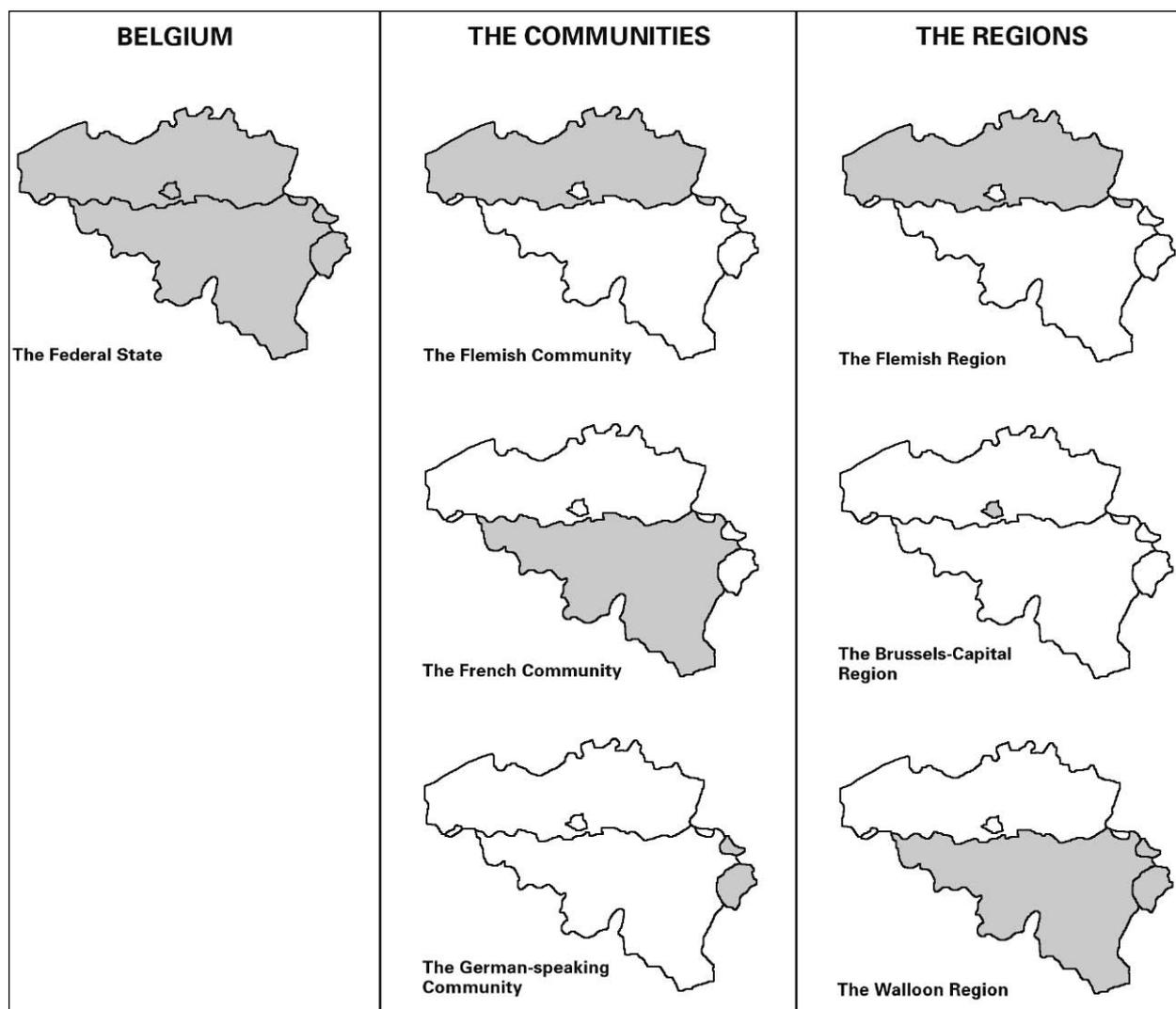


Figure 1: Belgium, a federal state which consists of Communities and Regions

the severe human impact on stand composition and structure in these forests, their natural value and biological potential is still quite high.

More than half of the forests in Belgium are privately owned. In Flanders, this number is even higher, about 70 %. Ownership is highly fragmented and private properties of 1 ha or less are very common.

2. History of protected forests in Belgium

(see also Goblet d'Alviella 1927, De Fraigne 1963, Tack et al. 1993)

General history of forests in Belgium

The Potential Natural Vegetation (PNV) in Belgium is broad-leaved forest dominated by beech and oak

on upland soils and by oak, ash and alder in riverine and swamp areas. However, nowadays there are no natural forests left in Belgium and the species composition and stand structure of the forests is generally different from the PNV. This is due to the prolonged and intensive human impact on forest ecosystems in Belgium (e.g., Goblet d'Alviella 1927, Tack et al. 1993).

Already by Roman times (50 BC – 300 AD) considerable amounts of forest had been cleared. Under the influence of abbeys, many forests were cleared between the 10th and the 13th century. In the former County of Flanders, the area covered by forests was reduced to a minimum as early as the 13th century (Tack et al. 1993). In the same period, overexploitation of forests on poor soils transformed many of them into extensive heathlands, both in Wallonia and in Flanders.

Table 1:
Major forest types and extent in Flanders and Wallonia. After Afdeling Bos en Groen 2001, Leyman & Vandekerckhove 2002, Lecomte et al. 2003 and Sanchez-Tovar 2003)

National forest types	Forest types for biodiversity assessment (FTBA, BEAR)	Flanders		Wallonia	
		Area (ha)	(%)	Area (ha)	(%)
Quercion-types	Mixed oak forests	32,000	23 %	69,200	14 %
Carpinion-types	Oak hornbeam forests	7,500	6 %	103,100	21 %
Fagion types (<i>Milio-</i> , <i>Melico-</i> and <i>Luzulo-Fagetum</i>)	Lowland and sub-montane beech forest	7,000	5 %	51,000	11 %
Other broadleaved forests (<i>Alnion</i> ; <i>Alno-Padion</i> and <i>Betulion</i>)	e.g. ravine, swamp, fen and flood plain forests	9,000	6 %	17,100	4 %
Poplar plantations	Poplar plantations	19,000	14 %	9,900	2 %
Total Broadleaves		74,500	54 %	250,300	52 %
Pine plantations	Pine plantations	40,000	30 %	20,000	3 %
Spruce plantations	Spruce plantations	3,000	3 %	172,400	36 %
Douglas fir plantations	Other plantation		-	10,800	2 %
Larch plantations	Other plantation		-	8,300	2 %
Other/mixed conifer plantations	-	19,000	13 %	20,700	4 %
Total Coniferous		62,000	46 %	227,500	48 %
Total forest area		136,500		477,800	

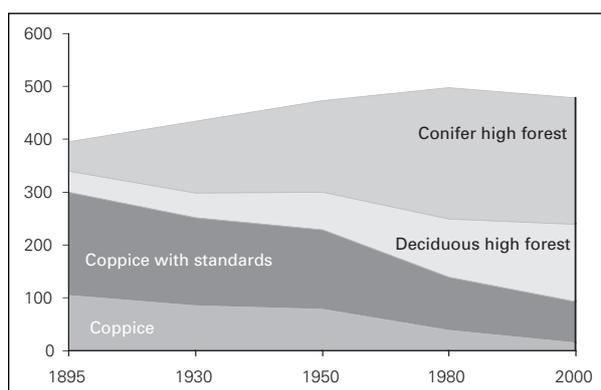
In general, the area covered by forests remained constant or even expanded between the 14th and the 18th century due to increasing demands for wood. Most forests were managed as coppice or coppice with standards (often with a limited number of standards). Only a few large forests owned by nobility and used as hunting areas were managed as high forest. The management was very intensive, especially in the coppiced forests, as the forest provided all kinds of goods; not only firewood, charcoal and construction wood, but also acorns (for pigs), and even litter and brambles were frequently removed for use as agricultural fertilizer and for domestic use. Forest grazing was also a common practice.

From the late 18th century onwards, when coal replaced wood as the principal energy source, forest cover declined again. This trend was strengthened by several famines and the secularisation and subsequent exploitation of forests formerly owned by monasteries and nobility. In 1850, forests occupied only 450,000 ha or 14 % of the total area of the country (Goblet d'Alviella 1927).

At the end of the 19th century, when agriculture became more and more intensive and the need for

Figure 2:
Evolution of the stand structure in Wallonia during the 20th century.

Data from Gérard & Laurent (1995) & Lecomte et al. (2003).



agricultural self sufficiency became less important, a new period of forest expansion started. At the same time, the demand for wood strongly increased due to the development of mining and other industries. This reforestation mainly occurred on the former heathlands and extensive grasslands with monocultures of Scots pine, Corsican pine and Norway spruce. In the broad-leaved forests, coppicing was

largely abandoned and a transformation to high forest took place (these trends are illustrated in Fig. 2 for the Walloon region). During the 20th century, abandoned meadows in the river valleys were transformed into plantations with fast growing poplar-clones and several valuable old forests disappeared due to urbanization. The two world wars also had disastrous effects on some old forest stands.

Forest protection during the Ancien Régime

The earliest formal forms of forest protection date from the 13th century, a period when forests had become relatively scarce (see above). At that time, the customary laws on forest use were first written down. For instance, the first version of the famous ‘*Keur-boeck van Soniën*’, an ordinance regulating the use in the Zoniënwood south of Brussels, dates from the end of the 13th century. Throughout the Ancien Régime these ordinances were regularly updated. Most of the ordinances had a repressive character and tried to regulate the local ‘rights of use’ like forest grazing, cutting of firewood, charcoal burning, hunting, etc. In summary, forest protection at this time tried to prevent the forests from overexploitation and to safeguard the (hunting) interests of the nobility.

After the fall of the Ancien Régime (French Revolution 1789), many forests owned by nobility and monasteries were taken over by the state, and many of them were privatised again and became the property of farmers, the newly-rich and industrial companies. Many forests were cleared and transformed into farmland, infrastructure, etc.

The earliest forms of forest protection in the Belgian state

The first Belgian forest act was passed in December 1854. This law regulated the exploitation of state forests, and included global regulations against direct deforestation and offences like poaching, theft of wood, etc. Like most other Belgian legislation it was inspired by its French counterpart, containing typical aspects of Napoleonic law. In this law the right of private property was very important: no right of access on private land, limited regulations of forest management on private land, but clear regulations for state forests and for offences against private property (including game). No regulations about protection of nature in forests were included and overexploitation was still possible in private forests. The latter was solved by a special law on private forests in 1931.

In the beginning of the 20th century, the first initiatives were taken for the protection of nature and typical forest landscapes. However, these were not nationally co-ordinated, but primarily local initiatives by private owners. A particular example of this was the creation of a ‘Canton Pittoresque’ in Zoniënwood (Forêt de Soignes). Under the initiative of the Academy of Arts a part of the forest was selected for aesthetic reasons, just like at Fontainebleau. Unfortunately the choice was not made to make it a strict reserve, but instead special cutting and pruning were undertaken to create ‘picturesque trees’. This ‘special management’ was abolished in the 1950s.

Forest protection for biodiversity

The first official initiatives on nature protection were taken in 1957: a Royal Decree of 6 April 1957 states that state-owned land can be protected as nature reserves ‘*in order to keep their unspoilt state, protect fauna and flora, encourage scientific research, tourism and education as far as they are in compliance with nature protection*’. In 1957, two nature reserves were created (the ‘Westhoek’ coastal dunes and the ‘hautes fagnes’ moorlands), but no forest areas were included.

The 1962 law on country planning, while aiming to stop the uncontrolled expansion of industry and urbanization, was also an important cornerstone in the protection of the countryside.

The first initiative for nature protection within forests was expressed in the ‘Law for Nature Protection’ in 1973. This law provided both statutes of Nature reserve and Forest reserve in order to conserve rare and threatened forest ecosystems. Nature reserves however were mainly focused on the protection of rare species and ecosystems of non-wooded areas. For forests, the concept of Forest reserves was conceived: they were to be managed in order to to conserve the composition and the structure of the vegetation. Hunting and wood production are allowed within certain limits.

However, since the beginning of the 20th century the forest administration has been preoccupied with afforestation and was largely oriented towards wood production. Even during the 1970s the management was still very traditional, and although more attention was paid to multiple function-forestry (with special attention to recreation) little interest was given to the creation of forest reserves. Moreover, the procedure for selection and recognition of these reserves was too complicated. Very few reserves were created, and the management installed didn’t differ much from the regular management.

In 1980 the forest and nature protection administrations were federalized and forest and nature management, policy and legislation were passed to the three regions (Brussels, Flanders, Wallonia). In Flanders, separate administrations were established for forests and for nature protection. This is not the case for Wallonia and Brussels where both responsibilities are still linked to the forest and nature administration.

In **Flanders** a new forest law, called the 'Flemish Forest Decree' was passed in 1990, and a new law on nature conservation (Nature Decree) in 1997. These documents are extremely important for forest management as a whole, and the conservation in forests in particular. In the Forest Decree, special attention is paid to aspects of nature protection in forest management. It also allows the establishment of forest reserves. The former impractical regulations on forest reserves were abolished, and a new procedure was stipulated in an 'Implementation Order on Forest Reserves' in 1993. In 1995 the first series of Forest Reserves was officially established. The Nature Decree regulates the establishment of both state and private nature reserves, providing important resources for co-financing new reserves. As well as the organisation of the management of nature reserves, the Nature Decree also anticipates the creation of new nature reserves of a total area of 50,000 ha, being part of a larger 'Ecological Network for Flanders'. Whereas, in earlier times, nature reserves were primarily focussed on the protection of open areas (heathland, wetlands, etc.) more and more forest areas are included nowadays.

In **Wallonia**, the 1854 forest act and the 1973 law for Nature Protection are still enforced. The former

has been updated by Regional decrees (voted by the Regional Parliament), especially for the creation of a regional permanent forest inventory, for incentive measures for owners and for the regulation of access in public and private forests. The latter has been recently updated (6th December 2001) through a decree dedicated to the conservation of Natura 2000 sites, but no major addition has been made in the field of forest reserves or nature reserves in forests. Management guidelines for Natura 2000 forest sites will be detailed in each designation order. However, new guidelines for the management of public forest areas were published in 1997, wherein instructions are provided for the sustainable management of woody resources as well as the protection of forest soils and water. Biodiversity guidelines still need to be prepared by the forest administration, in partnership with forest scientists involved into the Belgian Forum on Forest Biodiversity.

3. Current state

3.1. Main types of PFA, responsible organisations and procedures

In Belgium, regional governmental administrations are responsible for the administration and management of PFA networks, based on legislative instruments described in previous section. Reserves may be owned by the state or by private organisations

*Table 2:
Responsible organisations for selecting, designating and enforcing the protection of PFAs in Belgium.*

Name of organisation	Responsibility for PFAs	Web link
Administrations		
Flemish Forest & Green Areas Administration	Selection, notification and management of forest reserves	http://www.bosengroen.be
Flemish Nature Conservation Administration	Selection, notification and management of state nature reserves as well as Natura 2000 sites in Wallonia	http://www.natuur.be
Walloon Forest and Nature Administration	Selection, notification and management of forest and state nature reserves as well as Natura 2000 sites in Wallonia.	http://mrw.wallonie.be/dgrne/dnf/
Research centres		
Institute for Forestry and Game Management (Flanders)	Advisory body for the selection and management of forest reserves and responsible for monitoring in forest reserves	http://www.ibw.vlaanderen.be
Research Centre for Nature, Forests and Wood (Wallonia)	Advisory body for the selection of Natura 2000 sites and responsible for scientific monitoring in PFAs.	http://mrw.wallonie.be/dgrne/csg/
Non governmental organisations		
Natuurpunt	Purchase and management of private nature reserves	http://www.natuurpunt.be/
Réserves Naturelles RNOB	Ditto	http://www.mob.be/
Ardenne & Gaume	Ditto	http://www.ardenneetgaume.be/tf/

(Table 2). Whether they are state or private owned, management plans have to be developed for each PFA and approved by the Higher Council for Nature Conservation and by the Ministers responsible for Forestry and Nature Conservation. Forest areas included in large scale ecological networks (e.g. Natura 2000) have specific procedures for both designation and management.

3.1.1 Flanders

They are five different types of PFAs dedicated to nature conservation in Flanders (Table 3).

area of ‘non-intervention’ forest in nature reserves. As a rule of the thumb, one can state that about 60 % of these forests are strict reserves. The others receive special management, focussing on rehabilitation of ancient management practices (e.g. coppice or coppice with standards) or development of forest mosaic structures (grazing, restoring of glades, or heathland areas inside the forest).

Forest reserves

Forest reserves in Flanders are protected by the Flemish Forest Decree (1990). The main objective is

Table 3: Main types of PFAs in Flanders.

Name of PFA	Motivation for protection							Wood production	Number of sites ¹	Mean size (ha)	Total area (ha) ²
	Habitat conservation	Species conservation	Genetic conservation	Naturalness	Biocultural heritage	Soil & water protection	Landscape protection				
Individual forest areas											
Forest reserve	•				•			Forbidden	45	37	1580
State nature reserve	•	•			•			Forbidden	-	-	2020
Private nature reserve	•	•			•			Forbidden	-	-	2030
Large scale ecological networks											
Natura 2000 sites	•	•						Allowed	-	-	58 000
Regional ecological network (VEN)	•							Allowed	-	-	50 000

¹: number of sites in which forest covers most of the site area.
²: total forest area within PFA-type.

Nature reserves

Nature reserves are created under the nature conservation legislation (Nature Decree 1997, replacing the Law on Nature Protection 1973). In Flanders, nature reserves cover approximately 15,000 ha and are both state and privately owned (by nature conservation organisations) (Decler & De Belder 1999). Many more areas already owned and managed by the state or the private organisations are currently in the process of being designated as nature reserves. Where nature reserves used to be primarily focussed on open areas (peat bogs, heathland, swamps etc.), forests are increasingly being included in the network of reserves. An estimate of the actual forest area included in nature reserves is given in Table 3.

In nature reserves there is no clear distinction between strict reserves and managed reserves. As a consequence no reliable figures are available on the

to gather scientific knowledge about forest ecosystems, forest dynamics and biodiversity conservation. The total area of forest reserve in Flanders is approximately 1,670 ha (including about 90 ha of open areas like open water, grassland and heathland), subdivided into 45 areas, ranging in extent between 1 and 177 ha, with an average area of 37 ha.

The majority of the forest reserves are state owned (1,495 ha; so-called ‘Appointed forest reserves’ – ‘Aangewezen Bosreservaat’), although private owners and other public owners (communities etc.) can also propose their forest be designated as a forest reserve, and receive a substantial subsidy in exchange (so-called ‘Recognised Forest Reserves’ – ‘Erkend bosreservaat’). In both categories, ‘Strict’ (‘Integraal bosreservaat’) and ‘Directed’ forest reserves (‘Gericht bosreservaat’) are possible. In the strict reserves, no management intervention is allowed, while in the

Table 4:
Estimated area of the different forest habitat-types in Flanders and the actual area included in the Flemish Habitat-directive sites (Atlantic Domain).

Habitat type	Estimated area in Flanders (ha)	Share of the area included in Habitat-directive areas	
		ha	%
2180 Wood dunes of the Atlantic coast	450	267	59
9110 <i>Luzulo-Fagetum</i> beech forests	<10	5	50
9120 Atlantic acidophilous beech forests	7,000	7,676	110
9130 <i>Asperulo-Fagetum</i> beech forests	1,900	2,144	110
9150 Medio-European limestone beech forests	20	20	100
9160 Oak- and oak-hornbeam forests	3,900	1,770	45
9180* Forests of slopes, screes and ravines	0	0	/
9190 Old acidophilous oak woods on sandy plains	6,000	1,822	30
91D0* Bog woodland	0	0	/
91E0* Alluvial forests with <i>A. glutinosa</i> and <i>F. excelsior</i>	5,000	2,864	57
91F0 Riparian mixed forests	1	1	100
Total	24,500	16,580	68

*priority habitat types

directed reserves, special management for conservation and improvement of natural values dependent on human interventions is carried out. About 1200 ha are strict reserves, while the rest is subject to a special management.

Large scale ecological networks

The Habitat Directive areas in Flanders cover about 111,000 ha, while the Bird Directive areas cover about 70,000 ha. Many overlaps between the categories exist. Forests in Flanders are included in both Habitat- and Bird Directive areas. In total, more than 30 % of all forest in Flanders is included in the Natura 2000-network (58,000 ha), mainly as Habitat Directive areas (50,000 ha), whereas most Bird Directive areas are open land, marshes and heathland.

About 24,000 ha of semi-natural forest in Flanders meet the criteria and descriptions of the forest habitats included in the Habitat Directive (EC DG Environment 1999; De Keersmaecker & Vandekerckhove 2000) (Table 4). More than 60 % of these semi-natural forests are included in the Natura-2000 network, which exceeds the 20 % EC guideline (ETCNC 1999 a & b). Other forests included in the Natura 2000-network are primarily poplar and pine plantations that are considered as buffer zones and corridors for other habitat types (heathlands, grassland types etc.). Some of the rare and rich woodland types are almost entirely included in the Natura 2000 network. The inclusion of an apparent 110 % for type 9130 is due to an underestimate of the actual

area of this habitat type, and the fact that all forests of this type have been included in the Natura 2000 network. The difference between types 9120 and 9190 is very subtle, which gives over- or underestimation of the actual areas. For the evaluation, both types would be better taken together.

Besides the Natura 2000 network, it was decided to select 125,000 ha of the Flemish territory (approx. 10 %) to be included in a network where nature conservation is the predominant function (VEN). Another 150,000 ha of complementary 'connecting areas', where nature conservation is equally important to other functions (IVON), will constitute an ecologically functional network, where all important areas are safeguarded, and the migration of species between them through ecological corridors is possible.

The Flemish forests will form the 'backbone' of this network: all forests are planned to be included in one of the two categories. Up to now, the first 86,000 ha of VEN (main function nature conservation) have been delineated, including approximately 50,000 ha of forest. It can be assumed that eventually all forest reserves and nature reserves and most of the other important semi-natural forest stands (especially those included in Natura 2000) will be incorporated in the Regional Ecological Network (VEN). Roughly 60 % of all Natura 2000 forests and almost 90 % of the forests in nature and forest reserves are already included in the 1st phase of the implementation of VEN.

3.1.2. Wallonia

There are four different types of PFAs dedicated to nature conservation in Wallonia (Table 5). As will be detailed subsequently, most of these areas are subject to multiple-purpose management and some logging is often allowed in them. The average size of PFAs is between 20 and 60 ha.

vation purposes. Commercial logging is therefore forbidden in such areas. They cover 7,880 ha in Wallonia. 83 % of this area is owned by the Walloon Region and the remaining area is owned by nature conservation NGOs. As in Flanders, there are numerous nature reserves managed or owned by private organisations that do not have any official recogni-

Table 5: Main types of PFAs in Wallonia

Name of PFA	Motivation for protection							Wood production	Number of sites ¹	Mean size (ha)	Total area (ha) ²
	Habitat conservation	Species conservation	Genetic conservation	Naturalness	Biocultural heritage	Soil & water protection	Landscape protection				
Individual forest areas											
Forest reserve	•		•					Allowed	12	37	550
State nature reserve	•							Forbidden	42	50	c 2,000
Private nature reserve	•							Forbidden	17	30	c 700
Large scale ecological networks											
Natura 2000 sites	•	•						Allowed	-	-	160,760
¹ : number of sites in which forest covers most of the site area. ² : total forest area within PFA-type.											

Forest reserves

In Wallonia, forest reserves are protected under the law for Nature Protection of 1973 (see above). Management practices in these reserves have to be consistent with the guidelines based on this law and with the management guidelines dedicated to forest reserves (1979). Limited commercial logging, selective logging for forest health reasons and hunting is allowed in the Walloon forest reserves. Species composition and forest structure is maintained through close-to-nature management practices. All the forest reserves are managed for specific objectives and are characterised by a weaker protection status than nature reserves. Permitted management interventions are outlined in the management plan established by the forest administration and approved by the Minister responsible for nature conservation. Twelve reserves were created between 1981 and 2002, on a total of 550 ha (an average of 46 ha / reserve). These reserves are either owned by the Walloon Region or by some municipalities.

Nature reserves

Nature reserves are created under the law for Nature Protection (1973) and are managed solely for conser-

tion (about 3,000 ha). These sites are not included in the area cited above.

The extent of forest areas included in nature reserves is hard to get. A crude estimate is given in Table 5, using information collected through the Research Centre for Nature, Forest and Wood and the Walloon Forest Administration (DNF) (Table 5). These data need to be confirmed by detailed vegetation mapping of all the nature reserves (not available at the moment).

In private as well as in state owned nature reserves, forest covers about 40 % of the area. According to the law for Nature Protection (1973), these nature reserves can be managed for conservation purposes (directed reserves) or under non-intervention regimes (strict reserves). In practice, there is no clear distinction between both treatments. While a specific management plan has to be prepared and approved by the Nature Conservation Ministry before the recognition of private nature reserves, this is not the case for the state reserves. It should be a priority to prepare such plans for state nature reserves and forest areas in private nature reserves that are in the process of designation. In practice, forest nature reserves are often managed by the forest administration in part-

Table 6:
Area of the forest habitat-types included in the Walloon Habitat directive sites (Data from the Research Centre for Forest, Nature and Wood; DGRNE).

Habitat type	Estimated area in Wallonia (ha)	Conservation stage: A	Conservation stage: B+C
9110 <i>Luzulo-Fagetum</i> beech forests	39,910	40 %	60 %
9120 Atlantic acidophilous beech forests	2,710	5 %	95 %
9130 <i>Asperulo-Fagetum</i> beech forests	11,660	20 %	80 %
9150 Medio-European limestone beech forests	2,860	10 %	90 %
9160 Oak- and oak-hornbeam forests	22,390	25 %	75 %
9180* Forests of slopes, screes and ravines	2,890	50 %	50 %
9190 Old acidophilous oak woods on sandy plains	1,240	10 %	90 %
91D0* Bog woodland	1,970	45 %	55 %
91E0* Alluvial forests with <i>A. glutinosa</i> and <i>F. excelsior</i>	6,700	30 %	70 %
91F0 Riparian mixed forests	20	30 %	70 %
Total for forest types included into the Directive	92,350	31 %	69 %
Total for all forest types	160,758		

* priority habitat types

nership with the management commission for the reserve.

Large scale ecological networks

160,000 ha of forest have been included in the Natura 2000 network in Wallonia, i.e., 33 % of the Walloon forest area (Table 6). This includes ten habitat types in the first annex of 92/43/EC Directive (92,350 ha) as well as other forest habitats included in buffer zones (nearly 70,000 ha). 80 % of the forest habitats of Community importance which have been designated in Wallonia consist of beech and oak-hornbeam forests.

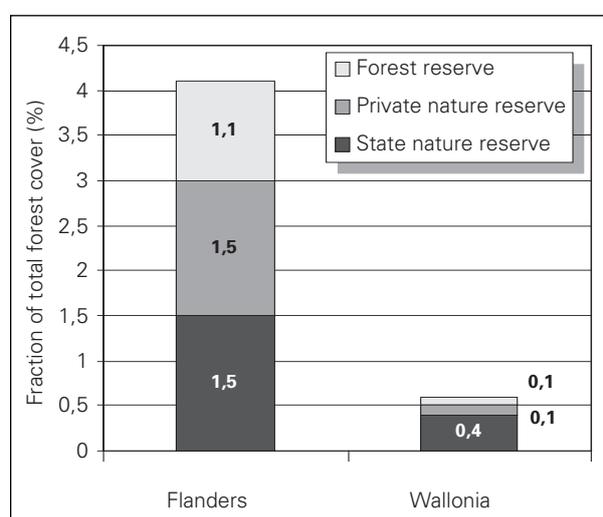
3.1.3 A comparison of PFAs between Flanders and Wallonia

Forest covers respectively 10 % and 32 % of the total area of Flanders and Wallonia. The forests in Wallonia have a larger proportion of indigenous trees (cfr. Table 1) and hence this region has a greater potential for the creation of forests reserves than Flanders. However, the relative area of protected forests in Flanders is roughly seven times higher than in Wallonia (Figure 3). The contribution of the three protection types is almost equal in Flanders, while most protected forests are situated in state nature reserves in Wallonia.

On the other hand, both the absolute and relative extent of the designated Natura 2000 forest habitat-

types are much larger in Wallonia than in Flanders (92,350 ha or 19 % vs. 16,580 ha or 12 %), despite the high designation rate for most forest habitats in Flanders (68 %). This confirms the high potential of the Walloon forests for nature conservation purposes. In both regions, management guidelines for forest habitats included in the Natura 2000-network still need to be developed.

Figure 3:
Protected forest areas in Flanders and Wallonia as a fraction of the total forest area in the respective regions differentiated by protection type.



3.2. Selection criteria and representativity

3.2.1. Flanders

In Flanders, no official selection criteria have been formulated for the selection of new forest and nature reserves. For both categories, the procedure provides for 'selection' based on the evaluation and best professional judgement of the experts in the different advisory bodies. However, some 'unofficial guidelines' are used to evaluate new proposals.

For forest reserves, an important document that is used in the preliminary evaluation of new proposals is Vandekerkhove (1998). Based on national and international literature, a clear set of criteria is formulated in this document for the selection of forest reserves in Flanders. A difference is made between reserves that can be integrated in a European network of strict

reserves on the one hand, and forest reserves 'sensu lato', that do not comply with the prerequisites of 'strictness' and size, but have other important nature conservation values. Basic selection criteria for the 'European' strict reserves are "representativeness" and 'size' (Table 7). The Flemish network of strict reserves should cover all major forest types in Flanders, with special attention to specific Atlantic forest types. The paper therefore also provides a first attempt to compile all the literature on forest typology in Flanders, in order to produce a complete overview of Flemish forest vegetation types. The minimum-size-criterion is largely based on the Dutch concept of Minimum Structural Area (Koop 1981). The other forest reserves that cannot be included in this European network can be classified into four types:

1. Very small strict reserves (cfr. 'Naturwaldzellen') that are too small for scientifically reliable studies

Table 7:

Main selection criteria for PFA in Flanders. Criteria importance for reserve selection: (1) primary importance, (2) incidental importance and (3) not taken into consideration

	Importance	Method for quantitative assessment
1/ Composition		
1A. Habitat representativity	1-2	Major forest vegetation types must be represented in the network of forest reserves. Widely distributed types must be represented in each of the different phytogeographical or climatic zones.
1B. Rare and threatened habitats	1-2	The reference list of rare habitats in Flanders of the Nature Report (Van Landuyt et al. 1999) is used to define threatened forest types (e.g. <i>Asperulo-Fagetum</i> and <i>Stellario-Carpinetum</i>)
1C. Vegetation integrity	1	Comparison of actual vegetation with PNV maps and phytosociological standards (Noirfalise 1984, de Keersmaecker et al. 2001).
1D. Signal species	2	-
1E. Red listed species	1-2	Red lists are published for numerous taxa, e.g. breeding birds, butterflies, carabid beetles, fungi, mammals, spiders, terrestrial mollusks and vascular plants. (http://www.instnat.be/content/page.asp?pid=ROL_startpagina)
2/ Structure/functioning		
2A. Vertical and age structure	2	-
2B. Natural regeneration	3	-
2C. Old-growth stages	2	-
2D. Soil and hydrology integrity	2	-
3/ Landscape ecological context		
3A. Forest cover continuity	1-2	Data on forest continuity are based on presence of indicator species and historical maps : a digital map of ancient forests (forest since 1775) is produced and used for this purpose.
3B. Old-growth continuity	3	-
3C. Minimal area for PFA designation	1-2	Size is based on international and national literature and depends on forest type (Vandekerkhove, 1998). Size ranges from 10 ha (alluvial forests) to 50 ha (acidophilic oak woodlands).
3D. PFA environment and buffer area	2	-
3E. Habitat diversity within PFAs	2	-
3F. Landform and topography	3	-

Table 8:
Overview of the forest types (according to De Keersmaecker et al. 2001) and their representation in Flemish forests and in forest and nature reserves

PNV-type	Area within Flemish forests (ha)	Area within forest reserves (ha)	Area within nature reserves (ha)
Unknown	17,146 (11%)	137 (8%)	420 (10%)
<i>Salicion</i> (softwood forests in tidal zone of large rivers)	2,285 (1%)	0 (0%)	74 (2%)
<i>Alnion</i> (Swamp-forest)	8,411 (5%)	202 (12%)	812 (20%)
<i>Alno-Padion</i> (Riverine forest)	18,777 (12%)	84 (5%)	546 (13%)
<i>Fagion</i> (Fagetalia, Carpinion, rich Fago-Querceta)	9,867 (6%)	339 (20%)	114 (3%)
Typical <i>Fago-Quercetum</i>	18,681 (12%)	421 (25%)	258 (6%)
Poor <i>Quercion</i> -types	80,802 (53%)	481 (30%)	1,822 (46%)
Total	155,969	1,664	4,047

of forest dynamics, but have an important value for nature conservation.

2. Spontaneously afforested areas, which have had the opportunity to develop for several decades without human interference.
3. Essential areas for the protection of rare species;
4. Forest areas with special management (e.g., coppiced forests).

For each of these categories, a clear set of criteria is given.

For nature reserves, the selection of new areas is primarily based on the opportunities that occur (areas for sale). Nonetheless, every proposal is screened on its actual value, based on following criteria: uniqueness, rareness, vulnerability, naturalness, completeness, species diversity, etc. Many of these criteria are comparable with these for forest reserves, although aspects of rarity, diversity etc. are more important.

A preliminary analysis of the representativeness of forest types in nature and forest reserves was made by Leyman & Vandekerckhove (2002). The forest types are based on a PNV-model developed by De Keersmaecker et al (2001) that is linked to the digital soils maps.

Table 8 shows that all PNV-types are represented in the forest or nature reserve network, though some of the types are clearly over- or under represented. However, it should be noted that the figures only give a total impression of the forest cover in the different categories, and do not make distinctions between well developed semi-natural forests and plantation forests.

3.2.2. Wallonia

Some general criteria for the creation of protected areas are listed in the guidelines for the management

of forest reserves (1979) and in the guidelines for the management of public forests (1997). The objective is to create at least one reserve for each main vegetation type.

Up until recently, there was no real official strategy to build a representative network of forest reserves in the field. New biodiversity guidelines are however in preparation, where sound scientific criteria are proposed for the establishment of the reserve network: habitat representativeness, protection of rare and vulnerable species and habitats (namely Natura 2000 habitats*), presence of old-growth stages, forest continuity over time, etc. (see e.g. Branquart *et al.*, in prep.).

Three main reserve types will be recognised according to designation criteria: strict forest reserves (SFR) or 'scientific reserves', key-habitats and managed reserves (e.g. coppice forests and pasture woodlands) (Branquart *et al.*, in prep.). The more frequent habitat types (beech and oak forests) will have to be represented into the SFR network, with individual areas larger than 50 ha. Rare habitat types (e.g. slope and alluvial forests) and old-growth patches will be included in a network of smaller reserves dedicated to the conservation of rare and vulnerable species (forest key-habitats)

3.3. Inventories and monitoring

Forest inventories are carried out every 10 years in both regions (Table 9). They consist of a systematic sampling of circular plots positioned along a fixed grid of 1 km x 0.5 km (about 14 000 plots for the whole Belgium). In every plot, dendrometric data and the herb layer are recorded. The presence of a PFA does not influence the sampling, which means that only a limited number of plots are located in PFAs.

*Table 9:
Schematic overview of the nationwide forest survey*

Name of inventory	Regional inventories of woody resources
Description	Dendrometric data on living and dead trees + herbaceous vegetation survey
Treatments of PFAs	No
Spatial data	Systematic inventory along a fixed grid of 1,000 m x 500 m (14,000 survey plots for the whole country). Database MsAccess.
Responsible organisation	Flanders: Flemish Forest & Green Areas Administration Wallonia: Research Centre for Nature, Forests and Wood; University of Gembloux
First survey	1994 (Wallonia) & 1997-1999 (Flanders)
Frequency	10 years
Web link	Coming soon

More detailed inventories and monitoring programmes however are undertaken for PFAs. In all forest and nature reserves of Flanders, there is an inventory of vegetation types and of the herb and tree layers. Dendrometric characteristics are recorded in all forest reserves and many nature reserves. These inventories provide the basic information for the management plan, which has to be produced within 3 years after the designation of a new reserve. In the strict forest reserves, an elaborate monitoring programme of spontaneous developments is carried out, focussing on the tree and herb layers. Additional inventories of fungi, invertebrates (including saproxylics), birds and bats have been performed in a selected number of forest reserves. They are not performed on a systematic basis.

3.4. Landscape, spatial relationships and other considerations

3.4.1. Management of forests (not PFAs) in relation to nature conservation

3.4.1.1 Flanders

In Flanders, forest management is strongly regulated both for private and public owners. Two Decrees (Flemish law) contain most of the regulations: the Forest Decree (1990) and the Decree on Nature Conservation (1997).

The following regulations are valid in ALL forests, independent of ownership or inclusion in Natura 2000.

- Forest Decree (1990):
 - Every forest ownership of >5 ha has to have a management plan, that has to be approved by the forest administration. All tree harvesting operations have to be included in the plan.
 - Owners who do not yet have a management plan require a 'permit' for every forest operation.
 - Deforestation is strictly forbidden. Exceptions are made for infrastructure of national importance and for restoration of valuable biotopes (heathland, moorland, species rich grasslands). Compensations through new afforestations elsewhere can be imposed
 - No harvesting during the bird breeding season (April 15 - August 15)
- Nature Conservation Decree (1997):
 - No afforestation of valuable open biotopes (heathland, grasslands, moorland)
 - No drainage of valuable swamp-forest types (priority habitat-type 91E0)
 - Stand-still principle: after harvesting, indigenous species may not be replaced by exotic species

The following regulations are valid in all public forests. The published management regulations for public forests (Afdeling Bos en Groen 2001) incorporate very high standards for forest management, with special attention to nature conservation aspects:

- The basis is close-to-nature forestry, with small-scale interventions, no clearfelling is permitted with clearcuts (1 ha or more) only allowed in exceptional cases.
- Use of natural regeneration as basic principle.
- Conversion of all homogeneous exotic stands (conifers, poplar) to mixed stands and broad-leaved stands. Long-term goal = 80 % indigenous species on forest scale
- No new drainage of wet soils (only maintenance of drainage).
- Clear goals on the retention of dead wood (goal = 4 % of total biomass) and retention of old trees to remain in the stand for natural decay (at least 10/ha).
- Special attention and appropriate management to valuable non-forest biotopes in the forest complex (heathland, ponds, glades, ...).
- Special attention to rare and vulnerable species (hollow trees with bat colonies, breeding areas of rare bird species, etc).
- Special attention to rare local genotypes of trees and shrubs.

- No commercial harvesting in valuable and vulnerable riparian forests and swamp forests.
- Minimum of 80 % indigenous species in new afforestation (no afforestation of valuable open biotopes).

Legislation is being developed to make these regulations obligatory for private forest owners within the Regional Ecological Network (VEN) and voluntary for the others. Financial compensation is being provided.

3.3.1.2 Wallonia

In Wallonia, the forest act of 1854 is still in force. It regulates the functioning of forest administration as well as the management of public and private forests: logging, management planning, etc. Since 1854, some additional governmental orders have been added. They mainly concern subsidies for natural regeneration, forest thinning and pruning. New management guidelines have also been produced to promote sustainable management and multiple purpose forestry in public forests (guidelines n° 2619 of 22.09.1997). Among others, it includes the following considerations:

- Use of tree species adapted to soil conditions
- Genetic conservation (rare tree species and local ecotypes)
- Natural regeneration
- Uneven-aged structure
- Forest soil and water protection (limitation of clear-cutting, drainage, etc.)

Forest biodiversity guidelines are currently in preparation. These guidelines aim to develop biodiversity-friendly management practices in addition to previous considerations. They will provide precise benchmarks for the retention of dead wood and over-mature trees, forest margin management, protection of ancient forests, development of PFA networks, etc.

3.4.2. Socio-economic conflicts with PFAs

In some of the newly created reserves, the forests, especially plantations of conifers and poplars, are acquired in order to be felled for the restoration of open areas (heathland, grassland, etc.). This may cause concern and sometimes conflict with the forest administration and with public opinion, especially in

Flanders where the total forest cover is very low. The high subsidies for the acquisition of new areas by private organisations, is alleged to cause an increase in prices and may be a cause of frustration for other countryside-users.

There is little enthusiasm from foresters for the creation of strict forest reserves in Wallonia. In this region, forests are mainly seen as an economic resource that generates important revenue for municipalities and private owners. Fear of disease and insect outbreaks is another reason that can explain why such reserves are not very popular. One may note that foresters are even afraid of creating reserves in forests with very low productivity. It is linked to what can be called a 'manager syndrome'. Foresters don't want to be excluded from the management of woodlands and to give up any kind of forest exploitation, as they may consider this to be a denial of their role of manager.

Finally, the uncertainty about new legislation and regulations that are to be imposed (Natura 2000; Regional Ecological Network) is another concern for forest owners.

3.5. Future developments

There is a clear policy to increase the share of reserves in Flanders as a whole, and as a consequence also in forests. The aim is to realize a 3,000 ha network of forest reserves in the near future. For nature reserves the goals are even more ambitious: the actual size of about 15,000 ha should increase to 50,000 ha by 2007 (Decler & Debelder 1999). However, no distinction is made between forested and non-forested areas in nature reserves. In the future, nature conservation in and outside forests will be focused on sites within the Regional Ecological Network (VEN).

In Wallonia, emphasis will be put on the forests within the Natura 2000 network in the following years. Background scientific information prepared by the Belgian Forum on Forest Biodiversity is currently being used for the preparation of management guidelines for the development of forest biodiversity. Research projects will also start in a near future to prepare for the creation of a network of strict forest reserves on the basis of scientific criteria.

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