10 FORESTS

Covering almost a third of the territory, forests are a major component of the landscapes in Wallonia. They fulfil a range of functions, both economically (wood production) and environmentally (contribution to the carbon cycle, soil protection, water purification, climate regulation, biodiversity conservation, etc.) as well as socially or culturally (recreational activities, etc.). Forests are also characterised by their slow evolutionary processes, which implies developing a long-term vision. Owing to the various functions of forests, managing them involves a wide range of actors (owners, managers, operators, hunters, naturalists, walkers, etc.), with specific expectations and responsibilities, often focusing on one or another function of the forest. The role of the public authorities is to seek an optimal balance between these functions. Although the historical priority given to the economic function is still evident today, Wallonia has placed the multifunctionality of the forest and its sustainable development at the heart of its forest management policy.

The Walloon environment in **10 infographics**

FORESTS

THE WALLOON FOREST IN FIGURES

563,000 ha
33% of Wallonia

Types of owners (2018)

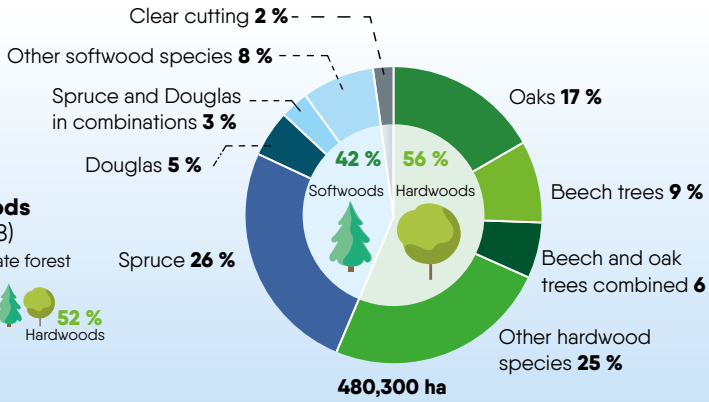
Public forest **49 %** — Private forest **51 %**

Distribution of softwoods and hardwoods (2018)

Public forest: **38 %** Softwoods, **61 %** Hardwoods

Private forest: **45 %** Softwoods, **52 %** Hardwoods

Main species of the productive forest (2017)



The wood sector in Wallonia

- **0.1 %** of Walloon GDP (2018)(forestry only)
- **8 171** companies (2020)
- **18 431** jobs (2020)

Harvesting and consumption of wood (2017 - 2021)

Harvesting of wood: **4.0 million m³/year**
Consumption of wood
- Lumber and industrial wood: **5.8 million m³/year**
- Wood energy: **2.7 million tons/year**

PRESSURES RELATED TO THE METHOD OF FORESTRY

Intensive forestry
unfavourable from an environmental perspective

Sustainability, resilience, carrying capacity of biodiversity

Mixed forestry
favourable from an environmental perspective

- Irregular structure (age and size)
- Mixture of species
- Presence of tiered edges, large woods, dead trees
- Exploitation by tree
- Sustainable mechanisation

Structural diversity (2018)
Forest stands
with regular structure: **55 %**
with irregular structure: **45 %**

Specific diversity (2018)
Forest stands
with 1 or 2 species: **57 %**
with 3 or more species: **43 %**

Tiered edges (2018)
Presence in **41%** of the points inventoried

Rate of exploitation (2004 - 2017) **: 102 %**

Dead wood (2018)
10 m³/ha
0.65 dead trees/ha in public forests

Harvesting by clear-cutting
→Erosion

Compaction

PRESSURES EXTERNAL TO THE FORESTRY OPERATOR

Overpopulation of wild ungulates

Destruction of habitats and small fauna
Damage (2008 - 2015) to
21 % of forest stands
41 % of the surfaces in natural regeneration
53 % of plantations

Tourism
113 millions visits/year (2006)

Climate change

Air pollution
Forest area impacted (2015) :
less than **0.5 %** for acidifying pollutants
6 % for eutrophying nitrogen

Pests and pathogens

STATE OF THE FOREST

Forest habitats of European interest (2019)
27 % of Walloon forests
100 % in unfavourable status

Herbaceous flora (2018)
Maximum **9** herbaceous species in **58%** of the points inventoried

Forest birds
- 22 % of population numbers between 1990 and 2020

Health status (2020)
Abnormal defoliation :
25 % of hardwoods
60 % of softwoods

Old growth forests
33 % of the current forest

FOREST MANAGEMENT

Legal instruments : Forestry Code • Law on Nature Conservation • Hunting Act

Management measures common to private and public forests

Checks by the Wildlife and Forestry Department
3,373 Official warning (PV) in2019

Forest certification (2020)
91 %of public forests
11 % of private forests

Subsidies

Protection of the forest environment
Forest reserves : **1 %** of Walloon forests
Natura 2000 : **27 %** of Walloon forests

Hunting
Shooting plan for deer :
17 % of shooting quotas not respected(2011 - 2020)

Monitoring

Ecological file of species

Specific tools

Public forests
Forest management plans
45 % of the public forest area (2021)
Objective: **100 %** by 2023

Private forests
Management support services

CHALLENGES TO OVERCOME

- Ensure responsible and sustainable management of hunting
- Continue the transition to sustainable forestry based on a multifunctional approach to forests
- Inform and raise awareness among forest owners

WALLOON FORESTS HISTORY AND KEY FIGURES

The Walloon forests are made up of hardwoods that gradually established themselves after the last ice age (around 15,000 BC): oaks mixed with beeches, ashes, maples, birches, etc. Controlling this resource began as soon as humans settled on the Walloon territory (around 5,500 BC) and harvesting of the resource has developed over the ages, accompanying the development of communication routes, the growth of cities and demographic growth. The era of intensive land clearing came to an end at the end of the Middle Ages, a period that saw the first developments of the metallurgical industry. At that time, the ownership of forest areas acquired its modern structure. There were four main types of owners: the sovereign (state forests), the "municipalities" (the origin of municipal forests), private secular owners (large aristocratic properties at first, to which small and medium-sized bourgeois and village properties were gradually added) and private ecclesiastic owners (large abbeys). The forest area subsequently continued to decline slowly, reaching its lowest ebb between 1840 and 1860. From that time on, the trend was reversed, with reforestation overtaking deforestation. The promulgation of the Forestry Code (1854) and the implementation of a genuine forestry policy did indeed encourage the reforestation of less productive farmland, uncultivated land and areas used by extensive agriculture (moors, etc.) (more than 100,000 ha in less than a century and a half). This reforestation was mainly based on imported softwood species (pines, firs and larches, followed by spruces and Douglas firs) and was intended to satisfy the growing demand for wood due to the development of industrial activity[(a)].

Two main types of owners

At present, Walloon forests cover just over 563,000 ha (33% of the territory). It is held by two main types of owners: public authorities (49 % of the total forest area) and private owners (51 %). The public forest belongs to the municipalities (35 % of the total forest area), the Walloon Region (12 %) and other public bodies such as the CPAS, the Provinces and the church administrations (2 %). It is primarily managed by the Department of Nature and Forests (DNF) of the Public Service of Wallonia (SPW). Private forests are held by nearly 84,000 owners. The vast majority of these (76,302 owners in 2018, or just over 9 out of 10 owners) own small properties of less than 5 ha. Private forests are managed by each individual owner, in compliance with the legislation in force.

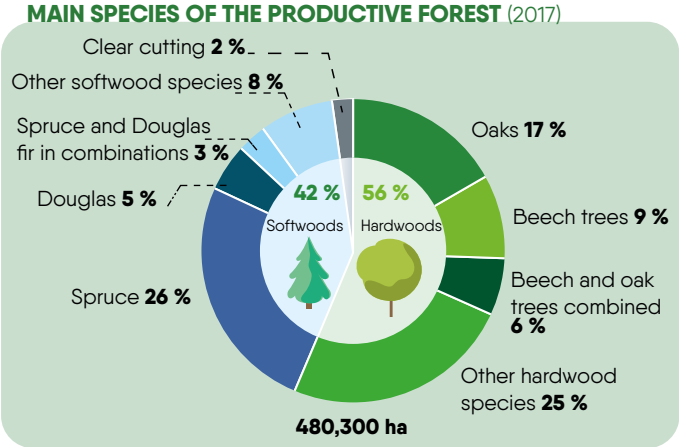
The length of a tree's production cycle, an important explanatory factor

To fully understand the issues related to forest management, we need to be aware of the length of a tree's production cycle: 100 to 150 years for an oak, 60 to 80 years for a spruce. Unlike agriculture, where crop rotations are short, the choices made by a forester commit him or her over time, and the results will accrue to future generations. This length of the production cycle largely explains the physiognomy of the private forest, which is characterised by a high degree of fragmentation and by a greater coverage of softwoods than in public forests. On the one hand, successive inheritances fragment the forest plots and, on the other hand, many private owners tend to favour faster-growing species such as spruces to maximise profitability. For public forests, the fact that institutions are permanent and that management is under the authority of the SPW allow for a long-term vision that integrates more nature conservation concerns alongside the productive aspect.

Productive forests dominated by spruce

In 2017, 85 % of the Walloon forest area (480,300 ha) was actually forested and corresponded to a so-called "productive" forest, i.e. a forest whose main purpose is wood production. The remainder was made up of "non-productive" areas, which correspond to roads, firebreaks, moors, open areas within the forest, etc. In terms of stand types, productive forests were composed of 56% hardwood stands and 42 % softwood stands, with the remainder made up of clearings (2 %). However, this distribution was not uniform according to the type of owner, with hardwood stands being more common in public forests (61 % hardwood and 38% softwood) than in private forests (52 % hardwood and 45 % softwood). Looking at the species present in Walloon forests, in terms of hardwoods, oak stands dominated (17 % of the total productive area), followed by beech stands (9%), and mixed beech and oak stands (6 %). Various other hardwood stands, often in mixtures (ash, maple, hornbeam, birch, alder, poplar, etc.) were also present (25%). In terms of softwoods, spruce stands dominated and represented 26% of the Walloon productive area. Stands of other softwood species (Douglas-fir, pine, larch, etc.), mixed or not, were also present (16 %).

MAIN SPECIES OF THE PRODUCTIVE FOREST (2017)



Wallonia is a net importer of wood

Although forests take up a substantial part of Wallonia's territory, the gross domestic product (GDP) of the forestry sector represented only 0.1 % of Wallonia's GDP in 2018. However, the forests are the source of an entire sector (forestry and logging, woodworking, production of pulp, paper and cardboard, furniture, carpentry, wholesale and retail trade, etc.) which, in 2020, had 8,171 companies and generated 18,431 jobs.

Over the period 2017 - 2021, wood harvesting in Wallonia represented a volume of approximately 4.0 million m³ per year. This wood is used either as timber (construction wood, furniture, etc.), or as industrial wood (panels, paper pulp, etc.), or as "energy" wood (firewood, wood pellets, wood chips, etc.), part of the Walloon production being exported (mainly to Germany until 2018, then to China since 2019). The consumption of wood for the same period amounted to approximately 5.8 million m³ per year, which is on top of the quantity of wood valorised for energy purposes. In 2019, this was estimated at 2.7 million tons per year, of which 1.8 million tons were produced locally. Wallonia is therefore a net importer of wood, with most of the imported wood coming from Germany, France and the Netherlands.

THE FOREST AS A PROVIDER OF A RANGE OF ECOSYSTEM SERVICES

Although it can be criticised for its anthropocentrism, one way to account for the essential and multifunctional role that the forests play is to list the ecosystem services that they provide, i.e. the benefits that humans derive from them. According to the categories considered by the Millennium Ecosystem Assessment, these services are:

- supporting services: primary production (all biomass produced by ecosystems), water cycle, nutrient cycle, soil formation, biodiversity conservation;
- provisioning services: production of wood, mushrooms, forest fruits, medicinal plants, hunting resources, genetic resources (e.g. used for animal and plant breeding and biotechnology);
- regulating services: climate regulation from a general perspective (carbon storage in the wood and in the soil) and from a local perspective (cooling effect), regulation of air quality (filtration, dust capture), regulation of the water cycle and water quality (filtration, purification), biological regulation (habitat for pollinating species or used in the biological control of problematic species) ;
- cultural services: aesthetic, heritage and symbolic values, recreational, educational and scientific activities, etc.

VARYING PRESSURES DEPENDING ON THE METHOD OF FORESTRY

Intensive practices remain widespread but the situation is changing

The method of forestry influences the sustainability and resilience of the forest[1], as well as the way in which biodiversity can thrive there. The choices made by a forester are therefore decisive in terms of environmental impacts. Until the end of the 20th century, the growth in demand for wood (harvesting of wood for energy, construction of wooden houses, furniture, panels, paper industries, etc.) combined with a desire to maximise the profitability of the forest for some owners, led to an intensification of forestry practices that enabled relatively faster production and competitive prices for wood that met the standards of the industry. This intensive forestry favoured softwoods over hardwoods, on account of their faster growth, and monospecific regular forests, i.e., forests composed of large adult trees from seedlings, all the same age and belonging to the same species, owing to the fact they were easier to manage. The structural diversity (number of crown levels, age and circumference of trees) and the specific diversity (number of species present) of the stands have therefore been impoverished. The desire to maximise the profitability of the forest also led to the removal of non-productive and/or unattractive elements such as tiered edges, dead trees or large wood.

Structural and species diversity of the stands are factors that influence the hosting capacity of the forest for fauna and flora. A diversified forest, by the variety of ecological niches it offers, meets the needs of a greater number of species. Furthermore, some species require different types of facies (e.g., an ungulate that will graze in more open areas and find refuge in more closed stands). A diversified forest also has more resistance to climatic stresses and pests and pathogens, and is more effective in protecting soils, especially on sloping land. The presence of trees of different sizes allows more light to pass through and the development of a shrub and herb layer that limits erosion. Walloon forests are currently dominated by mono- or bi-specific regular forest

[1] Sustainability is related to the production of sustainable resources (which are not depleted by human exploitation). Resilience is the ability of the forest to cope with ongoing changes (including climate change) and to recover its pre-disruption structure and function.

stands. However, a certain diversification, both in terms of structure and species, has been observed in recent years. As such, between 2008 and 2018, stands with irregular structure (two-level high forest, irregular high forest, stands containing both high forest and coppice[2], and naturally regenerated areas) decreased from 33 % to 45 % while stands with regular structure (plantation, young high forest, single-level high forest, and coppice) decreased from 67 % to 55 %. In terms of species diversity, stands with 3 or more species decreased from 30 % to 43 %, while less diverse stands with 1 or 2 species decreased from 70 % to 57 % (hardwoods and softwoods combined).

The presence or absence of tiered edges, i.e., edges consisting of several vegetation belts (forest mantle, shrub belt, and grassy hem) is also an important element for the forest environment. In effect, tiered edges serve to protect stands from wind and disease, provide favourable habitats and dispersal corridors for many species, and provide feeding grounds for wild ungulates, which reduce the pressure of these herbivores on forests and crops. In 2018, tiered edges were observed in 41 % of the points inventoried. Slightly more than half of them (54 %) had a high biodiversity hosting capacity (e.g., more than 3 diversification elements such as wetlands, vines, dead wood or rock piles).

Finally, the presence or absence of declining trees, dead wood (standing or on the ground), and large wood (i.e., live trees of exceptional size) are also factors that influence the sustainability and resilience of the forest. In effect, these elements allow the temporary storage of carbon. Dead wood is also a habitat and a source of food for many species (insects, fungi, etc.) which, through their action of decomposition and recycling of organic matter, help maintain the fertility and the production capacity of forest soils. In 2018, the volume of deadwood averaged 10 m³ per ha (compared to 8 m³/ha in 2008). From a nature conservation perspective and regardless of other forest functions, the ideal minimum volume of deadwood[(b)] that enables the preservation of most saproxylic species (species dependent on dead or decaying wood) would be 30m³ per ha for the European lowland forests corresponding to the Ardenne. As for the number of dead trees, this was estimated at 0.65 per ha in public forests in 2018, while the standard defined by the Forestry Code is 2 dead trees per ha. Trees of exceptional size (e.g. over 240 cm in circumference for oak or over 220 cm for beech) provide the necessary conditions for the development of a large number of species. The cavities made in them by woodpeckers, as well as those formed under the effect of lignivorous fungi or following the fall of branches, are then used by various species (birds, bats, mustelids). In 2018, nearly 78 % of inventoried hardwood forests contained no large live wood, a relatively stable situation since 2008 (82 %).

In addition to the various factors mentioned in the previous paragraphs, it should be noted that intensive forestry is characterised by a method of exploitation that has a relatively high impact on the forest ecosystem. Harvesting is most often done by clear-cutting at the end of the production cycle, using large machines. This technique allows an easy extraction and a high yield but it strongly impacts the environment: sudden modification of the ecosystem, disturbance of the fauna and the flora, compaction and degradation of the soils following the movements of the machines, erosion following the prolonged exposure of the soils, etc.

In addition to this intensive forestry, there are other forest management methods that are more likely to achieve the goal of a sustainable, resilient and biodiversity-rich forest. These management methods, which are characterised by mixed forestry, are increasingly developing in Wallonia. The stands are more diversified, both in terms of structure and number of species

[2] Single-level forest stand composed of trees with several stems from stock rejections

and in terms of ancillary elements such as edges, dead trees, etc. The harvesting method most often used is "per tree" or per block, which is less damaging to the ecosystem: trees that have reached their optimum value are removed.

Significant exploitation of spruce trees on account of their maturity

In a sustainably managed forest, the balance between removals and the growth of living wood produced by photosynthesis must be respected in order to preserve the resource. This balance is measured by the rate of exploitation. This rate must be established over a sufficiently long period of time to take into account cyclical effects caused by unforeseen events (storms uprooting trees, pest attacks requiring the felling of diseased trees, etc.). Over the period 2004 - 2017, for all species, removals were 102 % of growth, indicating slight overexploitation. However, the trees removed were not evenly distributed: for hardwoods, only 65 % of the volumes produced were harvested, while for softwoods, exploitation far exceeded production (122 %), due to increased spruce harvests where the removal rate reached 138 %. This is explained by the fact that many plantations planted in the 1950s and 1960s reached maturity. In the years to come, this situation will likely lead to supply problems for the wood industry. It should be noted that this rate of exploitation does not take into account the volumes felled as a result of bark beetle attacks over the period 2018 - 2020.

PRESSURES EXTERNAL TO THE FORESTERY OPERATOR

In addition to pressures specific to forestry, other pressures are generated by factors external to the forestery operator: local factors related to forest uses such as the overpopulation of wild ungulates and tourism, and more general factors such as climate change, air pollution and the development of pests and pathogens.

Overpopulations of wild ungulates causing widespread damage

Wild ungulates (deer, roe deer, wild boar) are a typical and fundamental component of the fauna of our forest environments. They contribute to the health of the forest ecosystem by influencing the dynamics of forest vegetation (seed propagation, maintaining open areas, etc.) and contribute to economic and social services related to hunting and tourism. However, overpopulations of wild ungulates have serious repercussions: impacts on biodiversity due to the overconsumption of certain plants or, in the case of wild boars, of certain small animals such as insects, amphibians, reptiles and birds, and through the deterioration and destruction of certain habitats; impacts on the regeneration of the forest due to the consumption of natural seedlings and plantations; damage to the stands through debarking, etc. Between 2008 and 2015, damage was caused to 21% of forest stands (97,100 ha), mainly in spruce plantations (50,900 ha). As regards natural regeneration areas, 41 % were damaged, while 53 % of plantations were affected.

In Wallonia, the balance between forest and wild ungulates is mainly dependent on hunting management, given that wild ungulates have no natural predators3. While the trend of rising wild ungulate populations is partly due to natural factors (mild winters, availability of natural food resources), it is mainly due to hunting practices that tend to maintain high densities of game for the benefit of hunters: feeding, selective shooting that spares female breeders., etc.

Tourism, another form of pressure

Various factors such as the higher share of disposable income spent on leisure, or the need for contact with nature have led to an increased use of forests. Forests are the setting for various activities: hiking, mountain biking, snow sports, spotting fauna and flora, youth clubs, etc. The numerous forest trails that are publicly accessible (about 9,000 km of trails and byways) facilitates these activities. According to a survey conducted in 2006[(c)], there are approximately 113 million visits to forests per year. Although they constitute an essential element of the cultural services provided by the forest, these activities are likely to affect the tranquillity of the forest and lead to a deterioration of the environment (trampling of sensitive biotopes, gathering wild species, degradation of paths by horses, mountain bikes, motorcycles or quads, waste left behind, etc.). Nevertheless, these nuisances are difficult to assess.

[3] However, the wolf reappeared in Wallonia in 2016. As of March 2021, there was one territorial wolf (located in the Hautes Fagnes) and 7 other wolves for which it was unconfirmed whether they were established. The lynx also reappeared at the end of 2020 on the banks of the Semois.

Climate change is disrupting forest ecosystems

As a consequence of the development of our carbon-based industrial societies, climate change is associated with changes in temperature and rainfall that are likely to radically influence the development and survival of native species (e.g., beech), and thus the composition of the current forest and functioning of the ecosystem. Water deficits and heatwaves in recent years have affected the growth and vitality of trees, making them more susceptible to pests and pathogens, the development of which may itself be facilitated by climate change. Beech and spruce, two species that are well represented in Walloon forests today, are particularly sensitive in this regard. Intensive forestry practices have also exacerbated the impact of climate change: regular monospecific stands, which have often been planted without taking into account local conditions (soil, topography, climate), are more vulnerable to climatic stresses. In addition to these changes in temperature and rainfall, there is also concern about more frequent storm events, which could uproot and weaken trees, making them more vulnerable to pest and pathogen attacks.

The impact of air pollution on the forest is becoming less problematic

When in excess, the atmospheric deposition of sulphur and nitrogen pollutants from human activities is a cause of degradation of forest ecosystems, *via* soil acidification and eutrophication. In particular, they can induce nutritional imbalances leading to the regression and disappearance of certain plant species. The acidification of forest soils is a natural phenomenon that has been exacerbated by atmospheric deposition of acidifying substances (SO_X, NO_X, NH_3). This deposition was problematic until the 1990s ("acid rain") but is no longer a problem today, due to the sharp fall in emissions of these substances at the European level. In 2015, less than 0.5 % of the Walloon forest area was affected by atmospheric deposition that exceeded the critical load[4] of acidifying substances. Nevertheless, the forest soils still show traces of this deposition: over the period 1994 - 2012, 75 % of the soils under the forest were acidic, with a pH water of less than 4.5, a hardship threshold for the vast majority of species, and 10 % had a pH water of less than 4.0, the threshold under which toxicity phenomena can appear. Eutrophication is the accumulation of nutrients in an environment, whether terrestrial or aquatic. The situation has improved significantly for forest ecosystems: between 1990 and 2015, the share of forest area affected by critical load exceedances of eutrophying nitrogen (NO_X, NH_3) decreased from 67 % to 6 %.

Pests and pathogens damaging forests

Pests and pathogens are naturally present in forest environments. Under certain circumstances, they can proliferate and affect the health status of forests. In recent years, diseases caused by pathogens and damage caused by pests have significantly affected the condition of Walloon forests. Examples include the ash chalarosis that appeared in 2015 and the spruce-inhabiting bark beetle crisis in 2018. Chalarosis is a disease caused by a microscopic fungus that causes leaf loss (defoliation) and, in most cases, tree mortality. In Condroz, the most suitable territory for growing ash and which was specially monitored in 2018, only 4 % of ash trees are free of the disease. The future of the ash tree in Wallonia will depend on the management measures put in place, including the preservation of the least declining ash trees, which could constitute a reservoir of trees less susceptible to the disease and thus ensure a new generation of more resistant ash trees. The bark beetle is a parasitic beetle that lives in spruce and lays its eggs under the bark of recently uprooted or broken trees and on freshly felled or weakened trees. The bark beetle crisis can be attributed, on the one hand, to recent climatic stresses (3 particularly hot years in succession) which weakened spruce trees and, on the other hand, to the inadequacy of the spruce plantation areas in Wallonia (inadequate altitude at less than 350 m, as in Famenne for example). The exploitation of diseased trees required the felling of 807,000 m³ of timber in public forests over the period 2018 - 2020, often with unfavourable financial conditions. In private forests, the figures are likely to be higher.

[4] The maximum amount of atmospheric deposition of pollutants that an ecosystem can assimilate without long-term adverse effects.

GENERALLY WORRYING STATE OF THE FORESTS

The state of forest biodiversity and the health status of forests are indicative of the impact of pressures on the forest ecosystem. Various indicators allow us to measure this biodiversity and evaluate the health of the forests.

Forest habitats of European interest in poor status

Certain types of forest habitats are of particular interest, either because they are vulnerable or endangered, or because they are rare, endemic or emblematic. Pursuant to the "Habitats" directive, Wallonia is obliged to protect and conserve these so-called habitats of European interest and to ensure that they are maintained or restored to a good conservation status. Ten types of forest habitats of European interest are found in Wallonia (e.g. beech alder forests, alluvial forests or wooded peat bogs/ oak-birch groves with purple moorgrass), representing an area of 151,608 ha (27 % of the Walloon forest). In 2019, the conservation status of these 10 forest habitats types was rated as unfavourable. The downgrading factors were mainly the lack of deadwood and large wood, low structural or species diversity of the forests, or soil compaction.

A low diversity of herbaceous flora

Within stands, the vegetation of the herbaceous stratum plays an important role in the hosting capacity for a wide variety of organisms, particularly for large herbivores. In Wallonia, according to the inventories carried out, the diversity of the species which make up the herbaceous stratum is generally low. In 2018, in 58 % of the points inventoried, the number of different herbaceous species was not higher than 9. However, there has been a positive shift, as the proportion was 69 % in 2008. However, there is no applicable norm in this case, as the specific richness of the herbaceous stratum depends on various parameters (type of natural habitat, age of the wooded state, ground illuminance, etc.).

22% fall in the numbers of common forest birds

Due to their high position in food chains, their wide variety of ecological requirements and rapid response time to environmental changes, birds are a good indicator of the state of biodiversity and functioning of the ecosystem. Common bird species[5] that live in forests show an overall decline in numbers. For species strictly associated with forest environments (e.g., the nuthatch or willow tit), this decline was 22 % between 1990 and 2020; for species that evolve in forest environments but are not strictly associated with them (e.g., spotted woodpecker or white wagtail), this decline was 36 %.

The health status of forest is a concern

Various factors influence the health status of trees. The main ones are: (i) extreme climatic events, (ii) the development of pests and pathogens, (iii) the choice of species unsuited to local conditions, (iv) natural nutrient poverty in many soils, and (v) the fruiting intensity. The defoliation of a tree, i.e. loss of leaves or needles, can indicate poor health status. Defoliation is considered abnormal and of concern from 40% of foliage loss, as this can lead to a risk of decline of the tree which can lead to its death in the medium term. Between 2010 and 2020, the percentage of abnormally defoliated hardwoods decreased from 34% to 25%. This relative improvement is mainly due to the strong resilience of oak, which was able to recover better than other species from the droughts of the early 2000s. Over the same period, the percentage of abnormally defoliated softwoods went from 30 % to 60 %. This deterioration in the health of softwoods is mainly due to attacks by the spruce bark beetle, mentioned above, and to a lesser extent to attacks by the Douglas-fir needle midge.

[5] Common bird species are the most common breeding bird species. These species are monitored annually.

One third of our current forests are old growth forests with high biological value

In Wallonia, of the 431,000 ha taken up by forest massifs in the 18th century, 30% have been cleared for agriculture and 26% have been transformed into softwood plantations. The remaining 44% has been continuously forested, representing an area equivalent to one third of our current forest(d). The appearance of these forests has varied greatly over time, in particular in relation to the forestry practices, but they have retained a preserved soil that has generally not been disturbed by either tillage or fertilizers, thereby maintaining a rich biological heritage. These days, the heritage value of these ancient forests is acknowledged. The Forestry Code requires these forests to be identified when forest management plans are drafted for public forests. Preserving them is also recommended to owners wishing to benefit from the PEFC label (see below).

MORE REGULATED MANAGEMENT IN PUBLIC FORESTS THAN IN PRIVATE FORESTS

The management of forests is governed by three main pieces of legislation: the Forestry Code, the Law on Nature Conservation and the Hunting Act. These laws impose standards, management measures or prohibit certain practices. In public forests, the Forestry Code also specifies a range of management methods. Public forests are managed by the Department of Nature and Forests (DNF) of the SPW, which works in close collaboration with the public owners. Private landowners have a relatively large degree of flexibility in managing their assets, with each landowner making decisions about their forest parcels (e.g., choice of species).

Various management measures are available to both public and private owners

The DNF verifies compliance with legislation in forests, whether public or private, and their agents have the quality of judicial police officers. In 2019, 3,373 official warnings were issued for various types of violations (hunting, poaching, fishing, nature conservation, etc.).

In addition to control, other management tools and measures apply to both public and private forests. Some tools are more related to prevention (forest certification, granting of aid for regeneration), others to the protection of the forest environment (protected sites and Natura 2000 network), to wildlife management (hunting), and others to monitoring and scientific research (measurement networks and the Framework Agreement for Forestry research and extension).

- Forest certification via a label is a voluntary tool for continuous improvement. By signing a charter, forest owners commit to striving towards international standards of sustainable forest management (e.g. diversifying the forest through a mix of species, ages and structures, restoring areas of biological interest). In 2020, 91 % of public forests and 11 % of private forests were PEFC certified[6]. "Aid for regeneration", i.e. subsidies granted to public and private forest owners to diversify their plantations, are another type of measure to move towards a resilient and sustainable forest.
- In addition to these voluntary approaches, the Law on Nature Conservation grants certain natural sites a protected status. As such, at the end of 2020, 6,572 ha of forest, or a little more than 1 % of Walloon forests, were registered in a reserve zone (forest reserve or integral forest reserve). These protected areas make it possible to maintain clusters of habitats and populations from which species can be redeployed. Within these areas, certain human activities are prohibited (harvesting herbaceous vegetation, using fertilizers and pesticides) or aimed at managing the environment (management based on scientific analysis with the aim of safeguarding characteristic or remarkable facies and ensuring the integrity of the soil and the environment). In addition, 150,586 ha of forest, or 27 % of Walloon forests, were registered in the Natura 2000 network. It should be noted that a significant part of the reserves are found in the larger matrix of the Natura 2000 network. The sites of the Natura 2000 network have been specifically

[6] PEFC (Programme for the endorsement of forest certification) promotes environmentally sound, socially beneficial and economically viable forest management. The FSC (Forest Stewardship Council) certification label only concerns a few dozen hectares of private forests in Wallonia, the DNF having opted for PEFC certification for public forests.

designated to protect areas essential for species or habitat types covered by the "Habitats" and "Birds" directives. In a Natura 2000 site, the owner is bound to respect certain obligations in terms of nature conservation, and undertakes, via a management contract, to adopt forestry management that allows him or her to fulfil these obligations (maintenance of ageing islands, designation of dead trees, choice of species adapted to the territory, etc.)

- As regards hunting, a compulsory shooting plan stipulating the number and characteristics of the animals to be shot is drawn up for deer. Non-compliance with the plan leads to fines. Over the period 2011 - 2020, 17 % of shooting quotas were not met. This figure can be explained by the level of the fines, which are too low to encourage implementation of the shooting plans, and, to a lesser extent, by the decline in deer populations in certain sectors and the inadequacy of the shooting plans, which will have to be revised downwards. For wild boar, there is currently no mandatory shooting plan. However, a plan is being prepared, given the high population densities.
- Finally, it should be noted that Walloon forests are rigorously monitored through a range of measurement networks and they are the focus of a research policy aimed at supporting their sustainability and resilience. Collecting data on the forest environment and analysing it constitute the basis for the implementation of a judicious forest management. Various measurement networks contribute to this objective: the Permanent inventory of forest resources in Wallonia, piloted by the DNF, provides quantitative and qualitative data on the state of the forests; the Walloon Forest Health Observatory monitors the health status of forests; the Walloon economic office for wood collects technical and financial data on the timber industry; and the Department of the Study of Natural and Agricultural Environment (DEMNA) of the SPW carries out biodiversity monitoring through fauna and flora surveys that make it possible to calculate biological indicators. The Framework Agreement on forestry research and extension fleshes out Wallonia's research policy for forests. It is implemented jointly by the various actors of Walloon forests and universities, and financed by the public authorities. One of its recent achievements is the ecological species sheet, a tool that guides foresters in choosing the species to be planted.

Forest management plans, specific tools for public forest management

Forest management plans are required by the Forestry Code for any public forest that exceeds 20 ha in one holding. Based on an in-depth analysis of the environment, they set out the main guidelines (objectives, constraints) for sustainable management of public forests and constitute a guide for the work of the forester. The multifunctional nature of forests is central to these plans, ensuring a balance between the economic, social and environmental functions of the forest. For each forest concerned, a zoning is drawn up: 5 % of the area must be allocated to central conservation areas (priority objective: conserving biodiversity), 30 % to biodiversity development areas (priority objective: wood production and conserving biodiversity) and 65 % to "other areas" (multifunctional forest areas in which sustainable management of wood resources is implemented without biodiversity taking priority over other forest functions). In 2021, of the total public forest area obliged to have a forest management plan, 45 % had an approved management plan. The objective of 100 % must be achieved by 2023.

Managing public forests is complex. Being public by their nature, they are accessible to citizens and must theoretically meet the various objectives of multifunctionality set out in the Forestry Code. However, given that 71 % of public forests belong to the municipalities, and that the exploitation of the forest represents a source of revenue that contributes to the municipal budget, some municipalities tend to prioritise the productive function of forests to the detriment of other functions.

Effective management is difficult to implement in private forests

The fragmentation of private forests, a consequence of successive inheritances, is a major obstacle to adequate forest management, as is the lack of knowledge on the part of some owners in forestry and nature conservation. It is generally considered that using professional forest management assistance services is only cost-effective for a forest area of 20 to 30 ha or more. Nevertheless, the private forest sector has organised itself to provide owners with a variety of management support services. For example, the Royal Forestry Society of Belgium organises management support for private owners (training, reviews, services, etc.) and promotes sustainable forest management, in particular through the PEFC label. Other structures support landowners in their forestry management operations: the Nature, Land and Forests association, the Support Unit for private small-scale forest ownership, the National Federation of forestry experts, etc. Despite this structuring of the sector, there are major differences between, on the one hand, the large-scale landowners, who are generally well trained to manage their territory and have the necessary resources, and, on the other hand, the smaller-scale landowners, who are often unaware of the principles of forestry management and have limited financial resources.

TOWARDS A DIFFERENT TYPE OF FORESTRY

Walloon forests are subject to multiple pressures. Recent observations indicate a significant loss of biodiversity and degradation of forest health over the past several decades, mainly due to a combination of forestry and hunting management methods that do not always ensure forest resilience, climate change, and attacks by pests and pathogens.

Ensuring the sustainability and resilience of forests will require, inter alia, responsible and judicious management of hunting in order to achieve densities of wild ungulates which are compatible with the preservation of ecosystems. This management must include a calculation of the optimal wild ungulate densities in relation to the hosting capacity of the environment, the implementation of shooting plans that make it possible to achieve a forest-ungulate balance, and the effective verification of these shooting plans. As was the case for the Forestry Code, the Hunting Act, which dates from 1882, needs to be revised to place it in a context of sustainable management.

However, the main challenge in the years to come will be the restoration and preservation of ecosystems, which guarantee the sustainability of forests. This restoration and preservation requires more suitable forestry, based on a multifunctional approach to forests and the principle of irregular and mixed treatment of forests, with exploitation by tree or by blocks. Switching to this type of forestry, promoted in Wallonia through the "Pro Silva" system of the DNF, is nevertheless a radical change compared to regular monospecific forestry based on optimising the wood production function. Implementing these new forest management practices will require a major effort to inform and raise the awareness of forest owners, whether private or public, and to adapt the downstream timber industry.

The need to adapt forestry practices is also acknowledged at the European level. In July 2021, the European Commission adopted the new EU Forest Strategy 2030, a flagship initiative of the European Green deal, which builds on the EU Biodiversity Strategy 2030. This strategy will help achieve the European biodiver-

sity objectives as well as the carbon neutrality objective by 2050. It sets out concrete actions to improve the quantity and quality of Europe's forests and enhance their protection, restoration and resilience.

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Main data sources

SPW Environnement - DEMNA ; SPW Environnement - DNF ; OEWB

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