

Criterion summary

The forest ecosystem is a complex set of species interacting with each other and with their environment. Sustainable forest management protects the integrity of the ecosystem and the various components of the biodiversity (genetic diversity, specific diversity, functional diversity and diversity of ecosystems) for the smooth operation of the ecosystem.

Certain indicators in Criterion 4 provide information directly on the **state and changes of part of the forest biodiversity** (direct indicators).

- Of the trees, first and foremost. Metropolitan French forests have 194 species of trees grouped in 66 forest species, including 58% broadleaved species and 42% conifers. The number of species is stable and there are no records of indigenous forest trees being extinct. Three species, however, are considered threatened nationally among the four species assessed in the *National Red List* (**Indicator 4.8**). The genetic diversity of trees is known for being more extensive than that of other animal or plant species. In metropolitan France, experts consider it to be stable (the current indicators for Criterion 4 cannot assess this aspect). The local wealth of forest species is virtually five species on 20 ares (**Indicator 4.1**) and tends to increase regardless of the type of stand (broadleaved or conifer). Similarly, since 2006-2009, the wealthiest stands (seven species and more) tend to increase in surface area, regardless of the type of stand. The mix rate, conveyed by the proportion of main species (**Indicator 4.1.1**), is low and without significant change in the conifer stands (their main species accounts on average for 80% of the abundance). It is higher and growing in the broadleaved stands (despite the lack of notable trend towards diversification for the large species – beech and pedunculate and sessile oak). The current situation seems favorable and is improving in the broadleaved stands. In comparison, the mix rate in the stands of main conifer or exotic species remains low and from this point of view, there is no sign that the change favors the biodiversity especially
- Of the other species, subsequently. The state and changes in the forest biodiversity are still little known: forest species are only listed for a few taxonomic groups and are missing for groups making a major contribution to the diversity of forest species (saproxylic organisms, insects, fungi, bryophytes, lichens, micro- and meso-fauna in the soil, etc.). The proportion of threatened forest species (**Indicator 4.8**) is assessed partially for a few taxonomic groups on the basis of *National Red Lists*. The number of threatened species among birds, mammals, amphibians and reptiles, the only groups with full data available, is 17%, 7% and 8% of species respectively in 2015. It is impossible to comment on the changes in Indicator 4.8, as the successive editions of the SMI have been based on different lists to assess the forest nature of species.

Other indicators under Criterion 4 provide information on factors likely to influence the forest biodiversity, through available habitats which dictate the presence of forest species or certain ecotypes (indirect indicators).

- The forest areas and therefore the forest habitats are growing (**Indicator 1.1**), basically through natural growth.
- The metropolitan forests are mainly semi-natural (82% of the total forest area – **Indicator 4.3**) and result from natural expansion or regeneration (76% of production areas – **Indicator 4.2**): this encourages the diversity of forest species and the genetic diversity of stands. There is no noteworthy national trend towards increased pressure on the biodiversity through an increase in artificial regeneration.
- The introduced species (**Indicator 4.4**) have to be watched over for risks of genetic pollution and hybridization of nearby indigenous species. Only a small proportion of forest areas (7%) falls under stands where the main species is introduced.
- The diversity of forest species is linked strongly to the old stages. An estimated two-thirds of forest species depend on forest stages beyond the logging age, with a wealth of old and large trees. Silviculture tends logically to reduce the proportion of these habitats in logged forests, combined with the dimension of timber with market value. **Indicator 4.3.1** shows that there are few high forest surface areas with very old trees in forests available for wood supply. Nevertheless, the increased volumes of growing stock, noted by the Criterion 1 indicators, also involve the large and very large trees (**Indicator 1.3**) which are more likely to offer micro-habitats than the small and medium-sized trees;
- Deadwood (**Indicator 4.5**) is known for sheltering a quarter of the forest biodiversity in temperate forests: its availability and continuity over space and time are decisive factors for the biodiversity. On average, our forests have nearly 17 m³/ha lying deadwood and 6 m³/ha standing dead roundwood

(values stable since the 2010 edition), but more than 60% of these volumes are made up of timber less than 20 cm in diameter; deadwood of more than 25 cm in diameter accounts for 5 m³/ha lying and 4.5 m³/ha standing. Improving the balance in the volume distribution per diameter class would be a good idea in terms of the biodiversity. The volume distribution of lying deadwood per decomposition class is more balanced, which encourages the saproxylic biodiversity. Lastly, there are significant regional disparities and some large lowland forests show lower-than-average deadwood levels.

- The large majority of forest areas belong to vast forest massifs (68% of surface areas are part of massifs covering more than 100,000 ha, only 9% are in massifs of less than 500 ha): the situation is globally favorable to the forest species mobile enough to cross 200 m spaces free of large infrastructures between two stands (definition of massif retained for Indicator 4.7). Despite the changes in method, **Indicator 4.7** suggests a tendency towards aggregation rather than fragmentation of forest massifs.

The forest policy for biodiversity is firstly, to encourage the inclusion of conservation of the biodiversity in current forest management and, secondly, to create networks of protected areas or those known as an advantage for the biodiversity.

Thus, the national forest genetic resource conservation policy (**Indicator 4.6**) relies on:

- *in* and *ex situ* conservation networks of species, which were constructed from 1986 onwards and continue to be added to regularly: the National Register of Basic Material includes 98 entities representative of the intraspecific diversity of forest trees at national level, with the aim of conserving the genetic resources and their dynamics and limiting the risks of alteration of indigenous resources by introducing inappropriate planting material. The *in situ* networks of conservation units have added 21 conservation units (+ 29%) since 2010. The *ex situ* conservation collections are updated regularly and were supplemented in 2014 with a new Salzmann pine collection.
- raising awareness to taking genetic diversity into account in the current management and in the protected area networks.

This goes beyond just genetic diversity: the protected forest areas (**Indicator 4.9**), with protecting the biodiversity as their main goal cover, in 2015, less than 1% of the forest area for class 1.2 of the Ministerial Conference for the Protection of Forests in Europe (MCPFE) (minimum intervention) and about 25% for MCPFE class 1.3 (active biodiversity management). For species linked to the minimum intervention areas (forest specialists, species dependent on deadwood, etc.), the surface areas with long-term protection status are very small compared with the total forest area; this justifies linking to other measures for taking the biodiversity into account which are less restrictive but over wider areas, for example the measures taken to set up belts of old tree and senescent tree blocks. Areas where the goal is to protect landscapes and natural elements (class 2) cover nearly a quarter of the national forest area, but these status fall more under the multi-functional management directed towards preserving the landscape and natural elements than conserving the biodiversity (regional nature parks, national park surrounding areas, biosphere reserves, etc.).

Conclusion

Although the Indicators for the *Sustainable Management of Metropolitan French Forests* are tending globally towards the protection of the forest biodiversity, the assessment proposed by the current indicators under Criterion 4 is partial and fundamentally indirect. It could usefully be supplemented by introducing national direct taxonomic monitoring of the forest biodiversity as well as developing other existing data (temporal abundance monitoring of common birds by the *National Natural History Museum* and forest inventory data from the *National Institute of Geographic and Forestry Information*).