

## REFERENCE FOREST IN CONTINUOUS COVER FORESTRY

### Etraye

A reference forest in continuous cover forestry is a forest area which illustrates this type of management on a full scale, directly within the ecosystem. It is also used as a place of research, training and exchange. Inventories ensure it is monitored and provide knowledge on the CCF and analyse, in space and time, the forest's resistance and resilience.

**The different visit formats (conferences, training, days of reflection, technical visits, etc.) make it possible to discover the dynamics and meet the different actors involved in management in continuous cover forestry (CCF).**



## Continuous Cover Forestry

CCF constitutes a global approach to the forest integrating its ecological, economic and social dimensions. It is based on the natural processes which govern the forest ecosystem.

The CCF is based on:

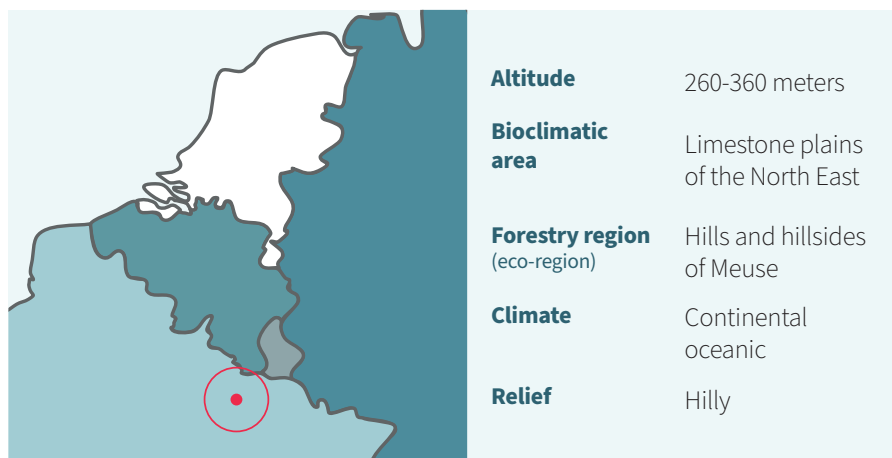
1. The mix of species per tree or per group of trees (regardless of the size of the stand).
2. Natural regeneration (wherever that is possible and sufficient).
3. Continuous forest cover which avoids clearcutting and its disadvantages as much as possible.
4. Gradual irregularity of the structure (age) of the stands.
5. Management at the scale of the tree (or by group of trees), the only scale allowing the ecological and economic characteristics of each tree to be taken into account, with the aim of producing wood of different qualities, in particular large timber with high added value, and to preserve the best tree-habitats.
6. Sampling the increase in volume of stands, guaranteeing the supply of the timber industry.
7. Improving the room for biodiversity thanks to the presence of a forest understory composed of herbaceous and semi-woody plants distributed over the entire forest surface.

## The communal forest of Etraye: a typical Lorraine beech forest

The communal forest of Etraye is located in the commune of the same name, in France in the department of Meuse, north of the national forest of Verdun. It extends over 209 hectares. It is managed by the National Forestry Office within the Territorial Unit of Verdun. The owner chose to apply continuous cover forestry, or irregular treatment, over 183 ha during the last development (2020-2039).

The objectives assigned to the forest in this development are the production of wood (high stakes), the preservation of environments and species, the protection of water resources and the maintenance of the landscape (medium stakes).

The forest is entirely located in the forestry-eco-region of the North-East limestone plateau. About 55% of the stands are in a plateau situation, on varying levels of decarbonation clays (low to high fertility). The rest of the stands are located on mainly North-West, North or East slopes, with some little marked anticlinal valleys.





## An inventory by “permanent plots” to know the forest

The objective of the inventory by permanent plots is to follow the evolution of the stands and to control the consequences of the management thanks to dendrometric data (linked to the trees), both economic and ecological.

A permanent plot is a point in the forest where all the trees are listed and remeasured periodically (approximately every 10 years). A considerable amount of data is collected both on the trees and on natural regeneration or the consequences of the browsing of seedlings by deer. This type of inventory therefore makes it possible to know the forest with more precision at the present time and in its evolution, for example in terms of composition in species, volumes of wood, value of capital, health, increments, ecological interest, etc.

92 permanent plots have been set up in stands managed in continuous cover forestry in the Etraye forest, over an area of 183 hectares. The inventory was carried out during the winter of 2021-2022. The statistical precision obtained is 6%, on the volume of living wood.

## The value of the stands

Continuous cover forestry must make the most of the existing stand but foresters sometimes inherit an unbalanced situation. To anticipate the economic trajectory of stands, it is useful to look at their value: a distinction is made between the so-called “consumption” value, which is the value at the time of the inventory, and the so-called “potential” value, which corresponds to a future value taking into account the increase in value of the stand.

In the forest of Etraye, the potential value is lower than the consumption value. This reflects the presence of wood beyond their economic maturity, which will be able to be collected in the short term, but also the deficit in trees for the future. To re-balance the forest, foresters must be particularly attentive to promoting small and medium-sized quality trees.

Consumption value

64 %

Potential value

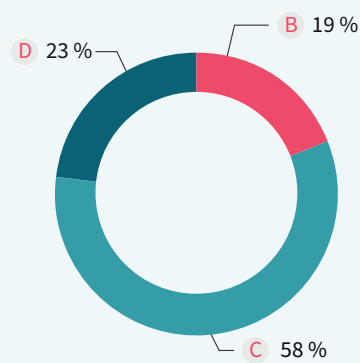
*Values of the forest (in relative importance)*



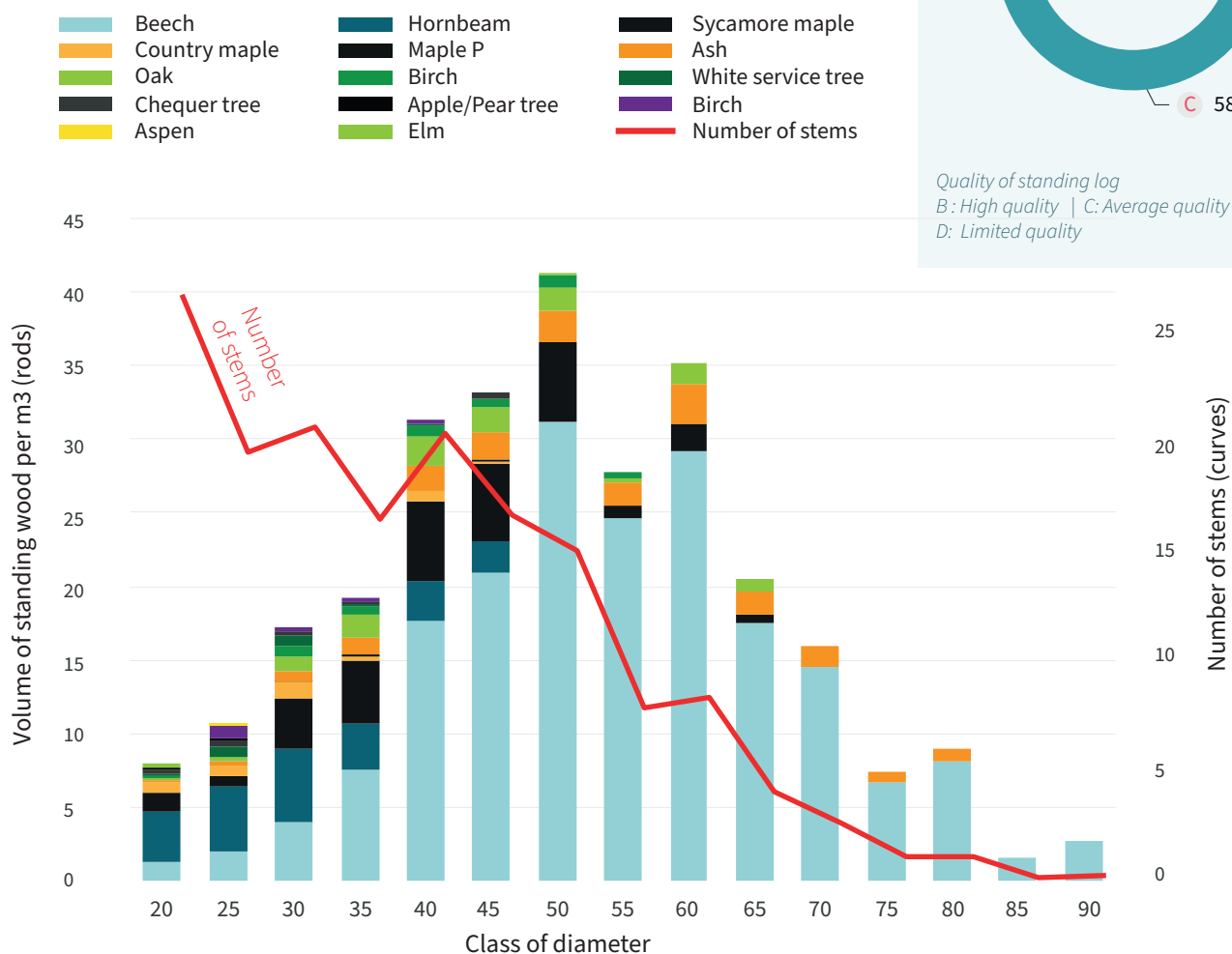
## Valuing productive capital

The communal forest of Etraye is rich in large and very large timber, which represents 57% of the capital, in volume of timber in the forest. This significant proportion of timber is an economic asset, as it allows the harvesting and marketing of mature timber. A balanced irregular forest can contain 50% of large trees permanently, continuously harvested and renewed and thus provide a regular income. Timber is also an environmental asset, as it concentrates ecological value.

The owner can count on 19% quality wood. The objective of forestry in years to come will be to make the most of this capital: harvesting mature wood to ensure income from the forest and improving wood still maturing, to allow it to grow better. Continuous cover forestry always maintains a productive capital, from which we periodically harvest the “interest”, i.e. growth. They also have several major forestry interests, such as seed production or light filtration, which promote the development of abundant and quality regeneration.



Quality of standing log  
B: High quality | C: Average quality  
D: Limited quality



Capital by species and diameter classes



Faced with the threat of climate change, how do we create a resilient forest?

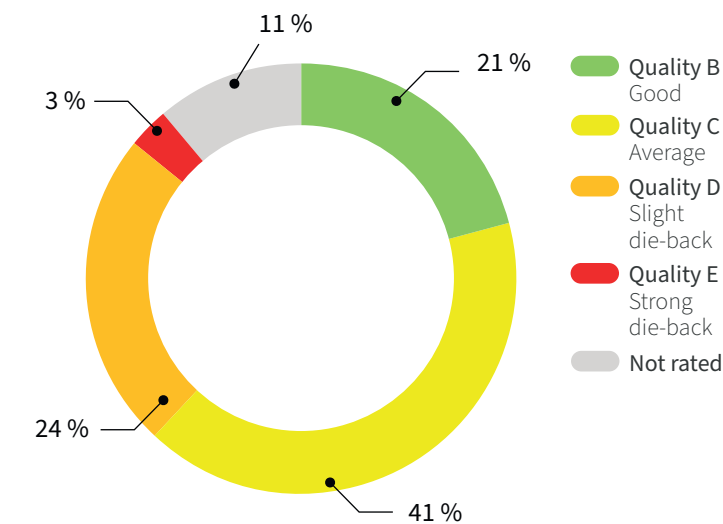
The Etraye forest presents factors of weakness in relation to climate change. Beech is an endangered species and represents 67% of capital in volume. Sycamore maple and ash also do not offer many guarantees about their role in long-term lumber production.

The consequences of repeated droughts are already being felt in the forest. A little over 25% (in volume) of the inventoried beech trees are considered to be in poor health, and, conversely, only 20% can be considered suitably healthy. To take the place of the timber in the event of increased die-back, there are some poles and small-sized trees, a historical legacy of the management, which did not seek to use them.

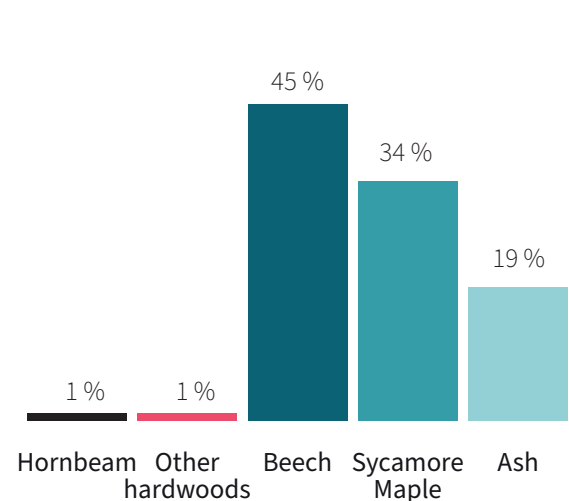
In these poorly diversified stands, the presence of mixed regeneration therefore becomes very important for the resilience of the forest. The seedlings are well distributed and in sufficient quantity, a sign that the owner can count on the natural dynamics. However the mix of species is not sufficient.

As the diversity of species has not been a priority in the past, the weak network of seed companies does not allow a good dissemination of the seedlings. In addition, the consumption of seedlings by deer strongly constrains diversification. These phenomena jeopardise the resilience of the forest.

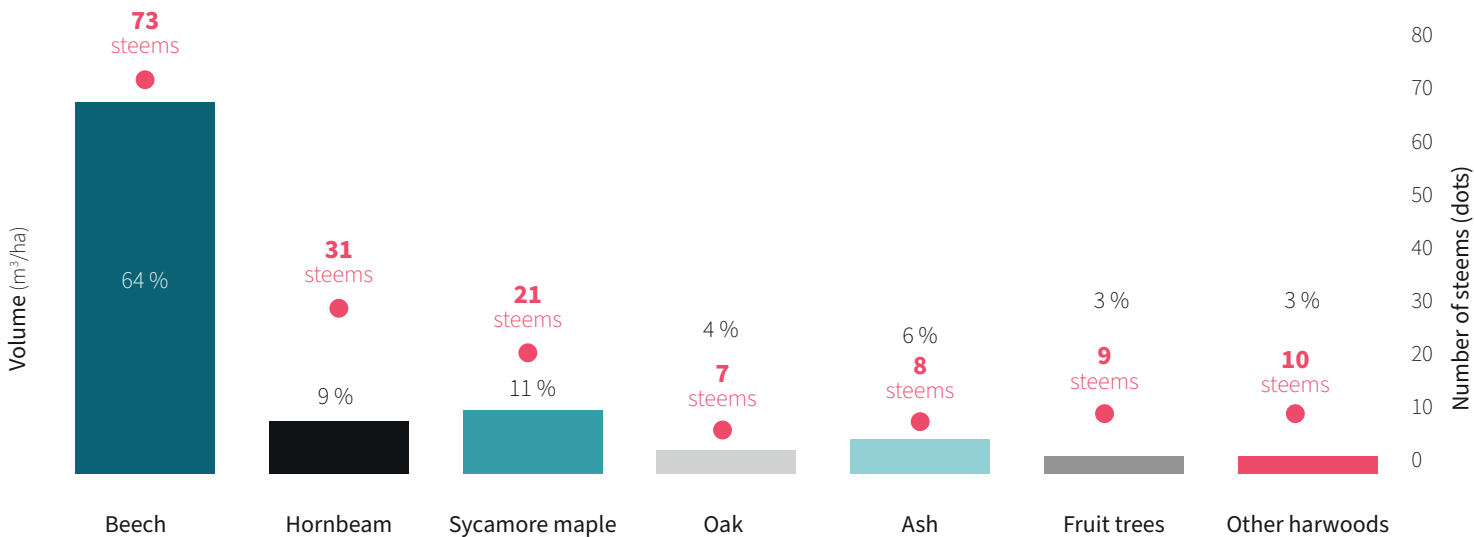
Fortunately, the large amount of timber is a trump card for the owner. In fact, the progressive use of timber will bring light which could be favourable to the development of a greater number of species. In addition, the management plan provides for the reinvestment of part of the profits from the harvesting of quality wood in plantations by small collectives within the openings created. Artificial diversification, used in addition to natural regeneration, is a tool which increases the forest’s resilience. This solution remains costly in the case of the forest-game imbalance which has been observed.



Health status of the beech\* (Volume)  
\*The health status has been measured in the conditions of a given year and must be checked over time. The permanent plots will make it possible to measure its evolution.



Composition of natural regeneration (number of seedlings)



Composition in species, volume and numbers of stems



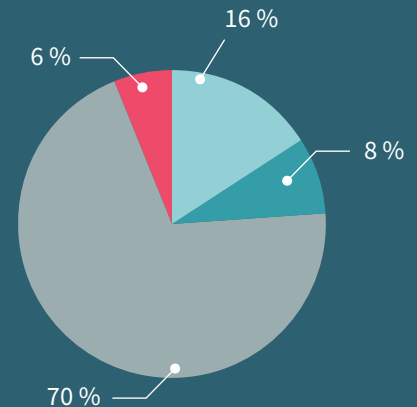
## Reconciling economy and ecology

A healthy ecosystem is essential for sustaining forest production and ecosystem services. Organisms which decompose deadwood are veritable forest engineers which fulfil essential missions for the forester, such as recycling organic matter to maintain soil fertility or decomposing dead branches to facilitate pruning. These organisms are also involved in the implementation of the carbon cycle and therefore the carbon sink function of forests. The management of the communal forest of Etraye is therefore mindful of preserving deadwood in the forest, both standing and on the ground. It is the large deadwood (diameter of more than 30 cm) which harbours the greatest number of species. It is estimated at 3.1 m<sup>3</sup>/ha.

Forest biodiversity plays an essential support role for many ecosystem services: pollination, seed dissemination, pest regulation, soil maintenance and slowing down of water flows, exchanges of organic compounds (notably via tree-mycorrhizae interactions), etc. The richness of the biodiversity and therefore the quality of these services is linked to the hosting potential of the environment. This potential is linked to several factors, some independent of management (presence of watercourses, rocky areas, etc.) but others linked to forestry practices: mixture of species, volume of deadwood or presence of "dendro-micro-habitats". The latter are small structures in the trees that are used by forest species as a place of shade or shelter, a place of food, a place of reproduction, etc.: cavities, cracks... The forest owner is therefore careful to preserve a framework of tree-habitats. In the Etraye forest, there are around 100 trees per hectare which have at least one micro-habitat. The most often observed microhabitats are mosses on the trunk, dead branches, a large amount of ivy, root concavities and areas of exposed wood.

### Deadwood

- Standing - Diam. < 30 cm
- Standing - Diam. > 30 cm
- On the ground - Diam. < 30 cm
- On the ground - Diam. > 30 cm



Volume of deadwood per category

### Mosses

40 %

### Dead Branches

26 %

### Ivy

20 %

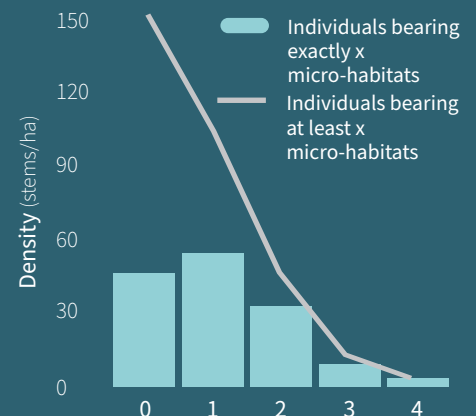
### Root concavity

9 %

### Exposed wood

6 %

Frequency of the main dendro-micro-habitats



Number of microhabitat types per tree

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