

OUR FORESTS ARE FULL OF LIFE!

Discovering the Index of Biodiversity Potential (IBP)



Grégory Sajdak © CNPF



Michel Bartoli © photothèque CNPF



Sylvain Gaudin © CNPF

Unimagined and fragile biodiversity

Forests are home to a large proportion of the Earth's biodiversity. Often hidden under the cover of dominant trees, tens of thousands of species of plants, animals, fungi and microscopic organisms interact. They are the living part of the forest ecosystem.

However, far from being pristine habitats, most European forests are subject to human interventions (logging, plantations, etc.) which transform the natural environment to a greater or lesser extent and on a long-term basis. In particular, the characteristics of felling operations and the choice of tree species strongly influence the species that are present. Our forests are therefore not immune to biodiversity depletion problems. Many species have become rare or endangered. According to a 2016 European Environment Agency report, 27% of mammals, 10% of reptiles and 8% of amphibians associated with forest ecosystems are considered to be threatened with extinction in the EU. There is also severe pressure on forest invertebrates and fungi, although the threats are difficult to assess due to a lack of data.

There are thousands of species in the forest!
In the Massane nature reserve (France), whose beech forest is a **UNESCO World Heritage Site**, more than **10,000 species** have been listed on 300 hectares!

What does "biodiversity" mean?

The term biodiversity refers to the diversity of living organisms in a broad sense. It is assessed on three levels:

- diversity of habitats (or ecosystems) at the landscape level;
- diversity of species within an environment;
- genetic diversity and variability of individuals within a species.

This document focuses on species diversity.

Why care about species diversity in forests?

TREES DO NOT GROW BY THEMSELVES!



➡ Because each species plays a role in way the forest functions: in plant regeneration (insert 1 in the diagram opposite, such as pollinating insects), in tree growth (insert 2, such as fungi) and in protection against insect pests (insert 3, such as bats). They also form a food chain and the absence of one link can have repercussions for many species. For all these reasons, all the forest services from which we benefit (logging, food gathering, support for recreational activities, water and air purification, carbon storage, etc.) depend on forest biodiversity.

➡ Because we recognise an intrinsic value in all living things. Biodiversity is a natural heritage that we wish to pass on to future generations.

➡ Because Europe is committed to conserving biodiversity through international agreements.

Vigilance and caution are required! It is possible (and above all necessary) to reconcile the different uses of the forest with biodiversity conservation.

The IBP: a practical tool for managers

The Index of Biodiversity Potential is a simple diagnostic tool that helps in choosing favourable practices. This indicator is based on a rapid assessment of ten features (or key factors) that influence the capacity of forest stands to support animal, plant and fungal species. Developed in France by the National Forest Ownership Centre (CNPF) and the National Research Institute for Agriculture, Food and the Environment (INRAE), this tool is now also used in other European and Mediterranean countries.

Ten key features for carrying

Selected for their relevance and ease of observation, these features make up

Pictograms:
groups of species
influenced by
the factor (not
exhaustive): see
bottom of page.

B

Vertical structure of the vegetation

Each layer has its own characteristics. For example, while the herbaceous and shrub layers may be rich in flowers and provide protection from terrestrial predators, the tree layer provides high perches and benefits from strong sunlight. Each one provides specific habitats (food resources, shelter, etc.), which supports species with different requirements.

Example: rodents prefer different layers for foraging: the Red squirrel (*Sciurus vulgaris*) in tree crowns (4), the Hazel dormouse (*Muscardinus avellanarius*) in shrubs (5) and the Bank vole (*Clethrionomys glareolus*) on the ground (6). Rodents are important allies in the transport of seeds, facilitating the regeneration of a large number of tree species.

E

Presence of very large living trees

Large-diameter trees, often also very tall and old, have crucial characteristics for many species. Among other things, they often provide varied tree-related microhabitats (see insert F), large branches that form platforms for fauna, and large, permanent supports (bark, roots, etc.).

Example: the Black stork (*Ciconia nigra*) builds its nest on large branches (10), the lichen *Chrysothrix candelaria* grows on the fissured bark of large trees (11) and the European wildcat (*Felis silvestris*) shelters in large cavities (12). Lichens are an important food source for many species.

(1)

(2)

(3)

(5)

(6)

(7)

(9)

(10)

(11)

(12)

Example: mycorrhizal fungi associating with the roots of particular tree species: *Russula amara* under Pines (1), *Leccinum quercinum* under Oaks (2) and *Russula betularum* under Birches (3). These symbiotic fungi are essential for the growth and survival of the trees.

Example: deadwood-dwelling species: Alpine longhorn beetle (*Rosalia alpina*) (7), Robust bracket (*Fomitiporia robusta*) (8) and the Great spotted woodpecker (*Dendrocopos major*) (9). These species contribute to the decomposition of wood and hence to maintaining soil fertility.

A

Diversified native tree species

The animals, plants and fungi in the forest strongly depend on the characteristics of the trees. Many species can only be observed where there are particular tree species present. The more different tree species there are in a forest, the more likely it is to support the diversity of species specific to each, in addition to more generalist species.

C - D

Abundant and diversified large deadwood

More than 25% of forest species depend, at some point in their lives, on dead wood or on tree-related microhabitats including decaying wood. Some use them as shelter, others as a food source, and still others reside there. A wide variety of types of dead trees (in terms of species, size, decay stage and position) is needed to support a diversity of associated species, each with requirements that are often highly specific.

F



Carnivorous mammals, rodents, bats



Reptiles



Amphibians

species diversity in forests

the ten IBP factors (noted A to J) that are used to complete a survey.

G

Flowers-rich open areas in appropriate amount

In a natural forest, temporary or permanent open areas punctuate the forest matrix. In these environments (gaps, forest edges, etc.), conditions differ from those inside the stand: there are more numerous flowers, greater variations in temperature and light, etc. Open areas in the forest diversify the resources and meet the particular needs of many species.

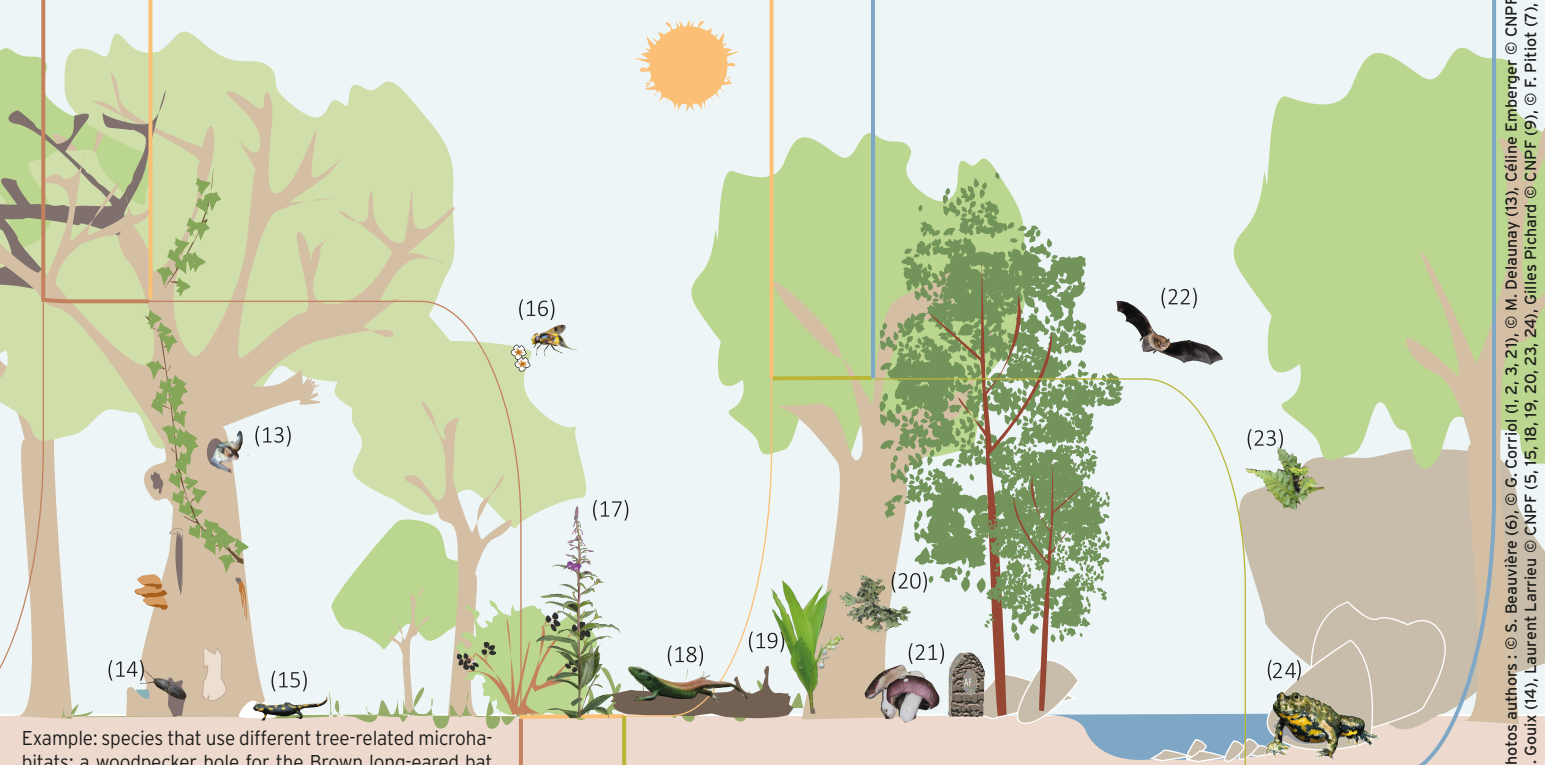
Example: the Hoverfly (*Volucella inflata*) forages for flowers in open areas (16), the Fireweed (*Epilobium angustifolium*) takes advantage of the light to establish itself (17), and the Sand lizard (*Lacerta agilis*) seeks warmth there (18). Pollinators such as hoverflies are involved in the reproduction of flowering plants, including some trees.

I - J

Diversified aquatic and rocky habitats

Rivers, ponds, peat bogs, boulders, crags and escarpments are often found in the forest. Like open areas, these areas are habitats for both specialist species and forest species that seek particular characteristics at a particular time of the day or in their life cycle.

Example: Daubenton's bat (*Myotis daubentonii*) hunts over water-courses (22), the Maidenhair spleenwort (*Asplenium trichomanes*) makes its home in microsoils in rock cracks (23) and the Yellow-bellied toad (*Bombina variegata*) breeds in shallow water areas (24). *Bombina variegata* feeds on invertebrates and helps to control their populations.



Example: species that use different tree-related microhabitats: a woodpecker hole for the Brown long-eared bat (*Plecotus auritus*) (13), a trunk base rot hole for the Violet click beetle (*Limoniscus violaceus*) (14), a root buttress cavity for the Fire salamander (*Salamandra salamandra*) (15). Bats contribute to the control of moth populations that can damage trees.

Example: species found mainly in ancient forest: the Lily of the valley (*Convallaria majalis*) (19), the Tree lungwort (*Lobaria pulmonaria*) (20) and the mushroom *Russula romellii* (21). Services such as carbon storage are particularly efficient in these ancient forests.

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Numerous and diverse tree-related microhabitats

The term tree-related microhabitat refers to morphological features of trees such as cracks and cavities. They are essential places for shelter, reproduction, hibernation and nutrition for many species. Each type of tree-related microhabitat hosts particular species. Thus, the more varied and numerous they are in a stand, the greater the chances of supporting a diversity of species.

H

Forest continuity over time

The history of a forest influences its biodiversity: recently established forests on former agricultural land do not support the same species as land that has been wooded for several centuries. In addition to old maps or aerial photographs, evidence on the ground may reveal a long continuity (ancient forest markers) or conversely a discontinuity in the forest cover (old agricultural terraces).



Fish



Insects



Mycorrhizal fungi,
deadwood fungi



Lichens

How to use the Index of Biodiversity Potential (IBP)?

The IBP survey does not require complex measurements or special naturalist knowledge of the species, except for the identification of trees. In practice, it involves walking through the stand and counting the items relating to each of the ten factors, for example the number of large dead trees or forest layers. On the basis of these observations, a score between 0 and 5 is assigned for each factor. Adding together these scores gives the IBP and characterises the stand on a gradient of low to high carrying capacity. It also makes it possible to identify features within a stand that are favourable to species diversity or, conversely, those that are insufficiently represented and which should be favoured during management activities.



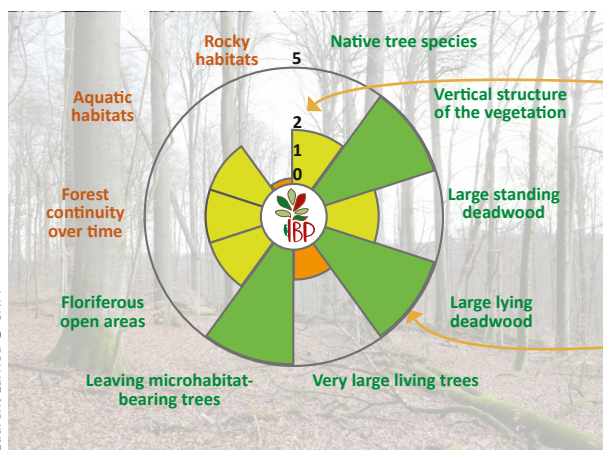
Céline Emberger © CNPF

From the IBP to practical recommendations - a common thread: habitat diversity and continuity

Forest species have highly diverse needs. However, the requirements of as many of them as possible can be met by increasing the number of habitats and ensuring their continuity in time and space. The IBP factors target the main habitats to be favoured. By following this common thread of habitat diversity and continuity, managers can reconcile wood production with maintaining a high level of biodiversity.

Example of an IBP survey in a stand

Management recommendations that can be derived (e.g. for factors A and D)



Laurent Larrieu © CNPF

Diversity

Seek to encourage the diversity of native tree species, which is fairly low here: conserve secondary species that establish themselves naturally in the understorey, in gaps and on forest edges.

The number of large dead trees on the ground here is favourable for biodiversity. If they are also diverse (in terms of their decay stages, species, etc.), they can support a wide variety of species.

Continuity in time

During the course of management operations, ensure that this diversity of tree species is conserved or encouraged, for example by giving instructions to logging operators and/or by including native tree species in regeneration operations.

These habitats are temporary and will eventually disappear. When felling, leave old trees standing, as they will not be used and will make up dead wood in the future.

Spatial continuity

Ensure that this diversity of species and large dead trees is present throughout the stand and not just concentrated in one place.

For more information

All documentation relating to the Index of Biodiversity Potential is available on the IBP website: www.cnpf.fr/ibp

- documents on the relationship between IBP factors and species, with practical recommendations for the manager: Emberger C., Larrieu L., Rotiel S., Gonin P.: 2023 - *Ten key factors for the biodiversity of forest species. Understand the Index of Biodiversity Potential (IBP)*.
- documents on the practical implementation of IBP survey in forests: IBP definition and survey method, survey sheets.

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