

How can we make sure that in the context of a changing climate, forests continue to offer us their innumerable ecosystem services?

In a domain where time is measured in units far longer than a century, forestry professionals must adapt their practices today so that future generations can continue to enjoy beautiful, living forests.

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Adapted skills and knowledge for adaptive forests

Continuous Cover Forestry (CCF), also known as “close-to-nature forestry”, seeks the best compromise between society’s wide-ranging demands. By drawing first and foremost on the natural dynamics of forest ecosystems, CCF creates a multi-service forest that: yields wood effectively, reduces the economic risk, preserves biodiversity, is an asset in terms of climate change adaptation, storing carbon and providing a welcoming space for people... and it also protects the soil, wetlands and water resources. With CCF, the forester plays an essential role! Foresters do a high-quality and rewarding job, because it takes genuine expertise and know-how to manage a mixed-species, multi-aged forest!

1 Mixed-species stand

A forest comprising different species of trees in a single stand is more resistant than a monoculture, being less vulnerable to insect attacks and disease. This kind of stand optimises the sharing of resources such as water and minerals, because the trees’ time frames and requirements, and strategies for managing them, vary according to the age and species of each tree.

2 Monoculture

Single-species stands (comprising one species of tree) are more susceptible to disease and to attack by insects. Competition between trees for the same nutrients and water is also more severe.

3 Multi-aged stand

Multi-aged stands are more resistant to disturbances, as their trees are more balanced as individuals (with more developed crowns). These stands recover more quickly from extreme events, notably thanks to the constant presence

of young trees in the understorey, ready to take over.

4 Bark beetles

Attacks by insects or pathogens can decimate a stand in a matter of days, and all the faster if the stand consists of identical trees. In recent years, bark beetles have devastated tens of thousands of hectares of spruce trees in Belgium, France and Germany.

5 Planting new trees over an area after clearcutting

Exposed to the elements, young tree plantations suffer more than mixed/older ones from dry conditions, direct sunlight, wind and snow. Due to the droughts and climatic changes of recent years, numbers of failed plantations are rising. Between 2018 and 2020, according to the French Forest Health Department, 25% of tree plantations in France failed. Given the cost of planting trees and the work involved in maintaining them, plantations are becoming risky investments! Fully exposed to the light,

young plantations effectively need a lot of attention: thinning, formative pruning and subsequent pruning, etc.

6 Uprooted trees

Storms, which are predicted to occur more and more frequently, lead to cascades of toppling trees. Very dense stands comprising trees that have undergone crown reduction are particularly at risk.

7 Conservation of habitat trees and deadwood

Preserving deadwood in the stand, and trees that provide micro-habitats or niches, helps to maintain a functional ecosystem.

8 Natural regeneration

Trees that have self-seeded cost nothing, and are highly resistant. They benefit from natural selection opportunities, and demonstrate “survival of the fittest” and most adaptable.

By harnessing self-seeding and all its resultant diversity, we preserve the soil and gain higher resilience at lower cost, thanks to the many plus points of this method:

- Natural selection; diversity and genetic adaptation of successive generations.
- Greater resistance to disease.
- Less likely to be appetising to insects and animals, compared to nursery-grown plants.
- Take root naturally and deeply.
- Highly likely to be able to adapt.

If necessary, the forester can increase the diversity of their stand by planting

small, localised diversification patches at different times.

9 Renewal under the cover of mature trees

With CCF, the forest is constantly renewing itself. Seedlings enjoy favourable conditions for their development, under the protection of tall trees. Thanks to continuous cover, the forest floor is protected from direct sunlight, wind and sudden changes in temperature. Trees that have self-seeded develop in harmony with their surroundings, and their quality improves thanks to natural selection and learning from their elders. They have slender branches and less of a tendency to fork during growth. Through targeted, economical, light-touch action, the forester guides the mix and nurtures quality.

10 Clearcutting

Clearcutting, i.e. felling and harvesting all the trees in a stand, causes long-term damage to the forest ecosystem (removal of the forest atmosphere, loss of biodiversity, compaction and rapid mineralisation of the soil, etc.) and leads to a significant loss of stored carbon. What’s more, when a stand is uniformly cut down, the suddenly denuded soil begins to be eroded by wind and rain. Also, these stands are usually replanted all at the same time, which is expensive and risky, whereas letting the area regenerate naturally means we can join forces with nature free of charge.

Forest management using clearcutting delivers a large, but occasional, financial return, and often goes hand in

hand with sacrifices in yield capacity: a proportion of the trees are cut down too early, meaning they have yet to reach their optimum-value size. After felling, the stand generates no further revenue for dozens of years, but during this period it still requires investment costs and management of the new plantation.

11 Continuous Cover Forest

When the forest is managed with a continuous cover approach, the soil is never left bare and the forest atmosphere (shade, moisture, vegetation) is preserved at all times.

Through gentle, regular interventions, the forester is careful to guide the mix of trees and maintain the understorey in ideal conditions to foster the spontaneous growth of saplings.

12 Chopping up branches and stumps

Chopping up tree stumps and remnants of felled trees leads to soil compaction, and provides favourable conditions for vigorous, fast-growing plants (such as grasses, ferns and brambles). This practice leads to uniformity in the vegetation and diminishes the biodiversity. Mineralisation of the chopped-up material is accelerated, and its carbon is rapidly released into the atmosphere. Systematic heavy work on the forest floor (ploughing, subsoiling, etc.) also has a major impact on the flora and fauna, especially geophytes (perennial plants that propagate via bulbs, tubers or rhizomes, such as the daffodil, wood anemone, lily of the valley, bluebell, Solomon’s

seal, wild garlic, sweet woodruff, etc.), characteristic of ancient woodlands

13 Carbon storage

CCF stores a consistently high quantity of carbon in the ecosystem. On the one hand, it means that large trees – significant carbon sinks – are always present and maintained. On the other, CCF does not leave the soil bare, and thus avoids the sudden mineralisation and soil carbon losses that result from such exposure.

14 Carbon loss

Half of the carbon in a forest ecosystem is stored in its soil. When the soil in a forest is left bare, for example after clearcutting or significant felling, a large proportion of the organic carbon in the soil is released into the atmosphere as a greenhouse gas. Even if a fast-growing species is replanted in the area immediately, it takes several decades for the carbon in the ecosystem to return to its initial level. If, in addition, groundwork takes place (rotary chopping, ploughing) even more carbon and organic matter is lost, and the impact on microfauna, mycorrhizal fungi and the soil structure is even more severe.

15 Standing crop

Cutting down several individual trees, while leaving the rest of the stand intact, preserves the ecosystem and all the biodiversity it supports. When a tree is harvested, it frees up a space for a new one, and allows light to penetrate the forest interior and nourish young saplings. Therefore, the skill

of the forester lies in choosing occasional, targeted actions to nurture high-quality wood and preserve the most sensitive species in the mix

16 Harvesting lumber

CCF produces high-quality lumber and a regular, frequent net income, even if producing from a single stand. It enables individual harvesting of trees that have reached maturity, while allowing other trees to continue growing, and preserving the ecosystem and its biodiversity. In addition, it offers a lot of flexibility from a management perspective. Lastly, high-quality lumber provides construction timber for end-uses that keep the carbon stored in the wood over longer periods.

17 Soil protection

Protecting the soil is a crucial element of CCF, which is always seeking to avoid soil compaction, erosion or loss of the soil’s organic carbon.

Therefore, to preserve the soil, the trees and natural regeneration, it is essential that plant machinery moves around within a network of predefined routes (felling tracks).

18 Soil compaction

If it were not mandatory for plant machinery to keep to the felling tracks, all the soil in the forest would be compacted by the vehicles’ movements. It takes just one or two vehicle movements on soil to destroy its structure, and up to ten centuries for that structure to be restored...

19 Natural evolution of open spaces

Open spaces naturally play an important role in the forest ecosystem. They allow development of the first stages in the forest’s natural cycle (the pioneering initial stages), and the biodiversity that establishes itself alongside. With the CCF approach, the forester harnesses these natural dynamics and guides them to steer the future make-up of the forest, while maintaining a diverse species mix.

20 High population density of large animals

The hunting approach is failing to achieve the objective of controlling numbers. Because large animals (stags, deer and boar) are too numerous, saplings have to be protected, which significantly increases the costs of rejuvenating the forest.

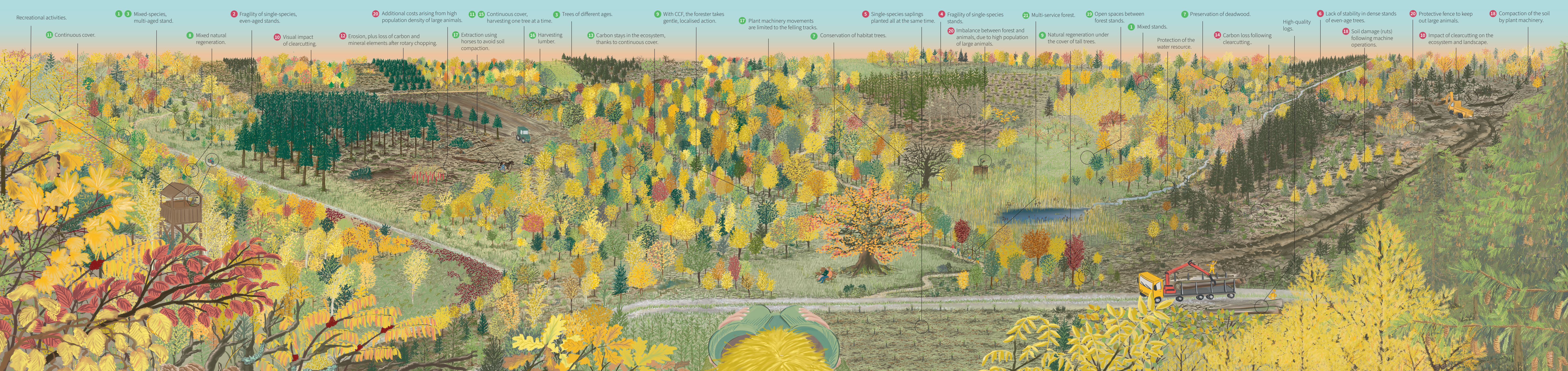
21 A plethora of services

Because it involves managing stands one tree at a time, CCF enables refined adjustments that can factor in many important elements: recreation, protecting the water resource, landscape, and the forest as a source of positive effects: improved physical and emotional well-being, artistic inspiration, heritage value and more.

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LIVING FORESTS FOR TOMORROW’S WORLD?

Let’s take a look at a forest landscape of today, with all its qualities and fragilities



Recreational activities.

1 3 Mixed-species, multi-aged stand.

8 Mixed natural regeneration.

10 Visual impact of clearcutting.

12 Erosion, plus loss of carbon and mineral elements after rotary chopping.

17 Extraction using horses to avoid soil compaction.

16 Harvesting lumber.

13 Carbon stays in the ecosystem, thanks to continuous cover.

9 With CCF, the forester takes gentle, localised action.

17 Plant machinery movements are limited to the felling tracks.

7 Conservation of habitat trees.

5 Single-species saplings planted all at the same time.

4 Fragility of single-species stands.
20 Imbalance between forest and animals, due to high population of large animals.

21 Multi-service forest.

9 Natural regeneration under the cover of tall trees.

1 Mixed stands.
Protection of the water resource.

7 Preservation of deadwood.
14 Carbon loss following clearcutting..

High-quality logs.

6 Lack of stability in dense stands of even-age trees.
18 Soil damage (ruts) following machine operations.

20 Protective fence to keep out large animals.
10 Impact of clearcutting on the ecosystem and landscape.

18 Compaction of the soil by plant machinery.