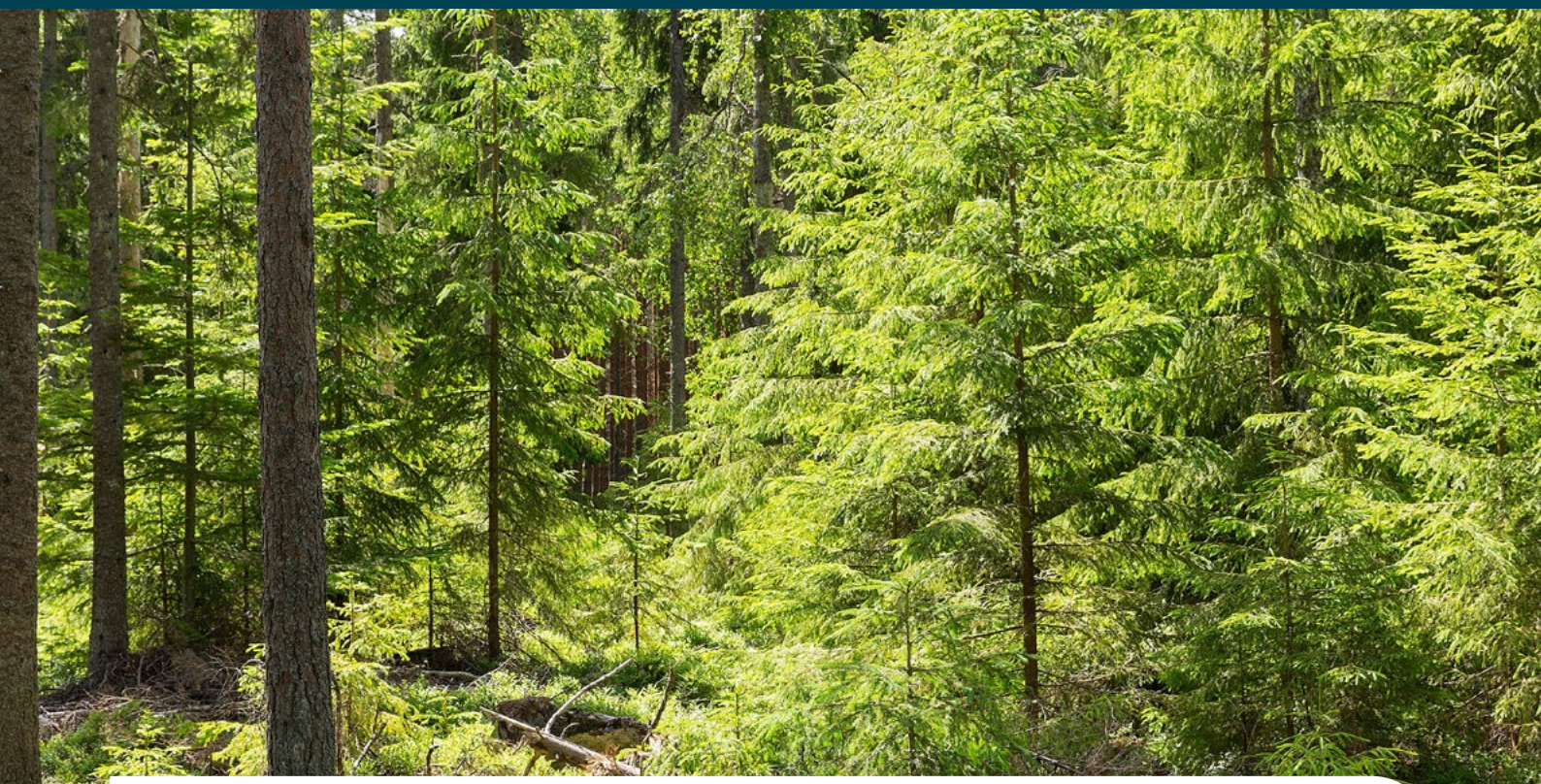
Policy Brief 2024



Continuous cover forestry in northern boreal forests – opportunities and challenges

It is important to understand the opportunities and challenges of continuous cover forestry (CCF). There is an urgent need for information on the effects of different continuous cover forestry methods. The many CCF-related knowledge gaps must be addressed in order to enable appropriate advice to be given to forest owners and stakeholders on when (and where) to apply CCF or rotation forestry. Further research is needed in various CCF-related topics in Fennoscandia in the coming years.

Recommendations:

1. Diverse set of forest management options are needed in the future.
2. The implementation of continuous cover forestry requires updated operational models.
3. More research is urgently needed on continuous cover forestry.
4. Sustainable forest management requires a comprehensive approach.

Luke

Recommendations:

Figure 1 | Continuous cover forestry demonstration area in Finnish Lapland. From the front to back: small gap cutting, selection cutting and seed tree cutting. Photo: Atte Mäkinen

Recommendation 1:

Diverse set of forest management options are needed in the future.

Based on research results, continuous cover forestry (CCF) offers benefits in suitable stands but is not likely to solve all problems currently attributed to rotation forestry (RF).

Recommendation 2:

The implementation of CCF requires updated operational models.

Successful and economically feasible implementation of CCF requires careful planning, trained personnel, proper tree species selection and choice of adequate silvicultural system.

Recommendation 3:

More research is urgently needed on CCF.

Without further research into CCF, knowledge-based decisions about best forest management practices cannot be made. This could lead to underuse of Fennoscandian forests' potential in achieving the UN Sustainable Development Goals, such as biodiversity protection, climate change mitigation, and sustainable economic growth.

Recommendation 4:

Sustainable forest management requires a comprehensive approach.

Sustainable forest management approaches, regardless of whether they involve CCF or RF, require a holistic landscape perspective that acknowledges multiple interests, values, and uses.

Luke

What is continuous cover forestry?

Continuous cover forestry (CCF) includes a group of silvicultural systems that maintain a continuous forest cover, and do not use clear-cuttings but retains large part of trees in the stand.

Silvicultural systems that are used in Fennoscandia to maintain a continuous cover are the selection system, the shelterwood system, and the group system.

Rotation forestry (RF)
Forests are managed by regeneration, juvenile forest management, thinnings and regeneration felling. During the regeneration felling majority of trees are removed, but retention trees are commonly maintained.

Continuous cover forestry (CCF)
Forest are managed by removing only part of the trees in each harvest. Harvestings are done regularly. Forest regenerates naturally through the trees left standing and usually no planting is needed.

Figure 2 | Continuous cover forestry (CCF) differs from rotation forestry that ends up in regeneration felling (e.g. clear-cutting).

Figure 3 | A stand managed with the selection system at two points in time. Even though the structure of the stand has changed due to tree growth and removals, the visual impression is near constant.

Figure 4 | A stand managed with the group system (gap cutting) at two points in time. Here, the group system is applied in a stand with large variation in tree heights. Gap cuttings remove only a few trees per gap, creating small openings in the beginning, which are slightly extended in later cuts.

Why to use continuous cover forestry?

Figure 5 | Minimisation of harvesting damage to growing trees is extremely important in selection cuttings. Photo Erkki Oksanen

CCF is likely to gain a wider application throughout Fennoscandia in upcoming years. Research is needed on the effects of CCF management, to assure a better, more balanced, and targeted provision of goods and services from Nordic forests as a result of this development.

Forest ecosystems in Fennoscandia are currently expected to meet many different management goals for ecosystem services, such as raw material production, carbon sequestration, biodiversity conservation, and adaptation to climate change. Some of these goals may conflict with each other. A wide range of forest management approaches and methods are needed to meet these contrasting goals.

Defining the best targets and opportunities for each management approach and combining different treatment methods appropriately can provide greater well-being, income, biodiversity, carbon sequestration, and recreational opportunities than any single approach or method alone.

Bottlenecks in continuous cover forestry

Forest regeneration

- In the context of CCF, natural regeneration is the preferred form of regeneration, but shelter density has a large effect on the regeneration process and results.
- The selection system, particularly suited for shade-tolerant species like Norway spruce, relies on continuous regeneration and ingrowth into larger size classes.
- Regeneration in gaps is challenging but generally satisfactory for both Norway spruce and Scots pine. However, seedlings usually grow slower, especially close to the gap edges.
- The shelterwood system promotes regeneration through a successive, uniform opening of the canopy. On the other hand, the remaining overstorey shelter trees reduce seedling growth.

Growth

- There is still a lack of knowledge on growth and yield in CCF. Most published studies are on the selection system with Norway spruce. Yield predictions are normally based on RF studies.
- Published comparisons of the selection system with rotation forestry (RF) show contrasting results. Generally, there seems to be a trend toward faster stand growth in RF.
- The optimal stand density trade-off for the selection system between stand growth and recruitment should be better investigated. Preliminary results show this could affect stand growth.

Economy

- Financial comparisons between RF and CCF are based on simulations in which the growth and yield of trees is estimated using a growth simulator.
- Studies have shown that the profitability of CCF depends on the initial state of a stand, especially the diameter distribution of the trees. The effect of discount rate also depends on the initial state.
- As a rule, the more the forest structure resembles the target diameter distribution of the trees in CCF (i.e., a forest with heterogeneous structures), the more profitable it is to use CCF instead of RF.
- The profitability of CCF increases with a more heterogeneous tree structure on mineral soil, higher applied interest rates, higher forest establishment costs, and poorer growth conditions (site type and temperature sum).
- Only few studies have been found that focus on peatland forests.

Figure 6 | Growth of understory spruce is often slow. Photo Erkki Oksanen

Multiple use of forests

- Sustainable forest management approaches, regardless of whether they involve CCF or RF, require a holistic landscape perspective that acknowledges the multiple interests, values, and uses that depend on the locally relevant economic, ecological, and socio-cultural circumstances.
- Most recreational users consider variation in the forest landscape and long-distance views as visually attractive. Landscape elements that are less valued are clearcuttings and soil scarification commonly carried out in RF.
- In general, CCF favours bilberries, while lingonberries and some mushrooms benefit from rotation forestry.

Figure 7 | CCF favours most recreational uses while RF is suitable for different uses at different stages. The situation also varies according to the season, as e.g. the cross-country skiing experience does not suffer from clearcuts whereas for finding false morels clearcuts are almost necessary.

Biodiversity

- Continuous cover forestry is likely to benefit species that suffer when the tree cover is removed, such as bilberry and its associated species. Species requiring spatial continuity in host trees or canopy cover may also benefit.
- Selection cutting may preserve the majority of species in the mature forest, but the most sensitive species may decline or even disappear. Gap cutting affects forest-interior species relatively little. Shelterwood cutting seems to closely resemble selection cutting in terms of species responses, in the long term, however, it does not produce the biodiversity benefits of selection cutting.
- Species that have declined due to forestry mostly require large living and dead trees. The preservation of these species is not ensured by CCF alone but requires deliberately maintaining these structural features.
- A mosaic of different forest-management practices within landscapes may provide complementary ways to maintain rich biodiversity.

Research needs in the near future

- How CCF impacts forest regeneration dynamics, growth and yield, genetic diversity and susceptibility to biotic and abiotic disturbance agents.
- Long-term effects; available studies are often short term and only evaluate the impact of single cuts rather than effects and dynamics over entire rotations (RF) or as a result of the multiple harvest cycles in CCF. The long-term monitoring of well-designed experimental trials with permanent plots in CCF-managed forests thus deserves more attention and research in the near future.
- A shift to CCF will often require conversion of stands established, and so far managed, under the RF paradigm. Best practices for the conversion of even-aged stands under Fennoscandian conditions are also lacking, and appropriate research is needed.

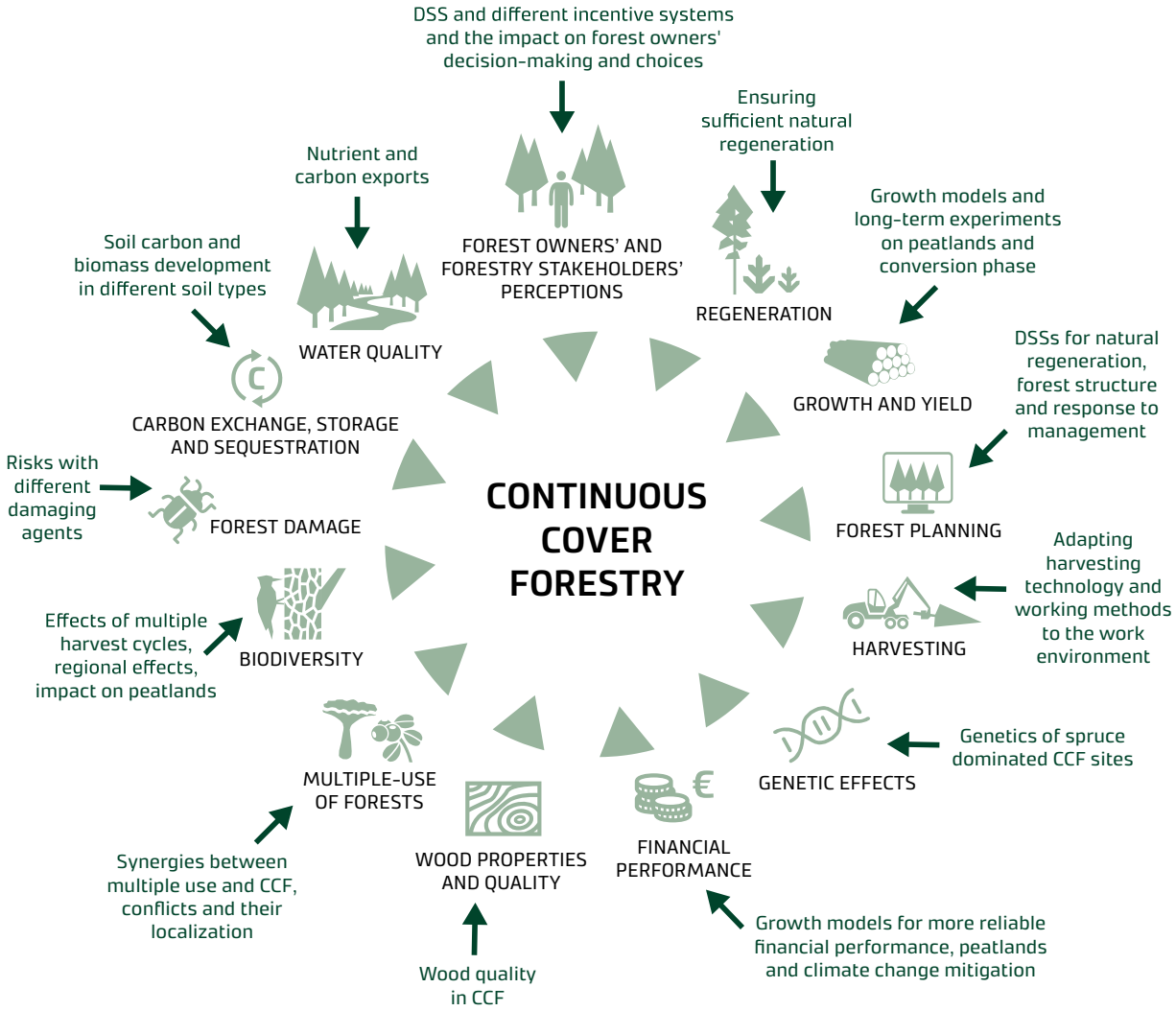


Figure 8 | Major knowledge gaps and future research needs for CCF in the Nordic region.
In the figure: DSS = desicion support system

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