

THINNING AS A CLIMATE-SMART FOREST MANAGEMENT STRATEGY

SUMMARY FOR FOREST MANAGERS

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What is climate-smart forestry?

Climate-smart forestry is a management strategy aimed at making forests more resilient to climate change, contributing to climate mitigation (e.g. carbon storage), and sustainably delivering ecosystem services. Potential climate-smart management interventions include planting new forests, increasing tree species diversity, and using woody products in a circular way. In addition, forest stands can be **thinned** to reduce competition between trees, thereby making forests more resilient to **drought**.



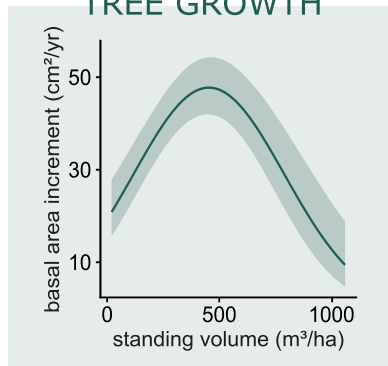
Does this strategy work in temperate deciduous forests? What happens to the forest microclimate and the fauna on the forest floor? Is it possible to promote not only **tree growth** but also forest **microclimate** and **biodiversity**, or do we have to make choices?

📍 National Park Brabantse Wouden

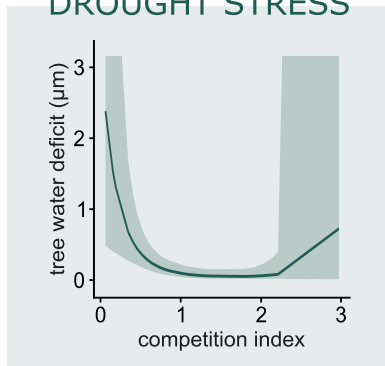
🌳 well-drained loamy soils

🌳 European beech and pedunculate oak

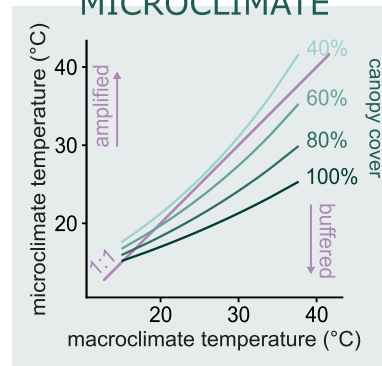
TREE GROWTH



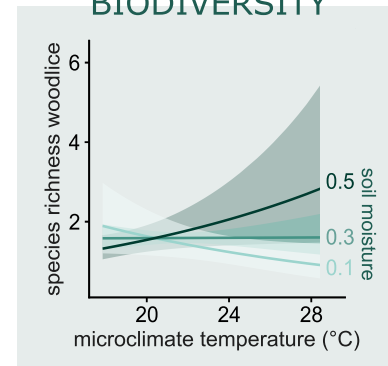
DROUGHT STRESS



MICROCLIMATE



BIODIVERSITY



- To maximize individual tree growth, we recommend a basal area of approximately ~30 m²/ha. This intensity roughly corresponds to moderate thinning.
- Is the stand denser? Thin the stand up to 30 m²/ha.
- Is the stand more open? Allow the forest to grow denser.
- The potential of thinning to alleviate drought stress in beech and oak is limited and inconsistent. Thinning is therefore not a silver bullet against climate change.
- Very intensive thinning is not recommended, as it may increase drought stress. Beech is particularly sensitive to this due to changes in the local microclimate.
- The forest canopy is the main driver of the forest microclimate.
- Keep the forest canopy closed to protect its thermal buffering capacity.
- Temperature extremes are amplified in forest stands with canopy covers below 50 to 60%.
- Soil organisms are sensitive to changes in forest structure and microclimate.
- Responses to these changes differ among soil organism groups and individual species.
- Biodiversity requires both habitat diversity and habitat quality.

How should I manage my forest?

There is no single or optimal management strategy that can simultaneously promote tree growth, microclimate, and biodiversity. Multifunctional forest management therefore requires **spatial diversity** at both local and landscape scales. By managing forests as a **diverse mosaic**, we can support different ecosystem components. Based on our findings, we propose a step-by-step framework that managers can apply in Flemish deciduous forests.

1 Delineate zones for microclimate conservation

Zones where the microclimate is important or will be developed (e.g. cold spots, microrefugia, conservation areas, forest cores) should be delineated.

Provide a buffer zone of at least 10 m to reduce edge effects. Avoid management interventions in these zones and keep canopies closed.

1

2 Diversify management across multiple scales

Outside the microclimate conservation zones, management should be diversified to provide a wide range of ecosystem services. Variation should be created at both local and landscape scale. Ensure a mosaic of structures (e.g. canopy cover, tree age, tree species), with attention to connectivity

2

3 Strengthen habitat connectivity

In addition to habitat diversity and quality, connectivity is crucial. Create a mosaic of habitats and make sure similar habitats are connected to each other. Use stepping stones or corridors through less favorable environments to allow species to move through the landscape according to their needs.

1

3

TIPS

- Select zones for microclimate development based on characteristics linked to cooler microclimates that are less influenced by climate change.
- Besides vegetation, microclimate and microrefugia are shaped by landscape characteristics such as topography (e.g. slope, aspect), soil (e.g. texture), and hydrology (proximity to water).^{1,2}

Zones with canopy covers below 60% should be kept limited in extent, as temperature extremes are amplified rather than buffered in these areas.

- Introduce openings selectively and consider their potential long-term ecological effects.
- Keep forest cores closed and limit the number of management objectives in small, fragmented forests.

Map core habitats, existing connections (e.g. hedgerows), and barriers (e.g. roads), and identify where additional connections are needed.

- Prioritize connections that benefit multiple species (multifunctional corridors).
- Collaborate with surrounding landowners to create new connections.

