THE ROLE OF BIODIVERSITY IN MAKING FORESTS RESILIENT

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Background

Biodiversity supports key services like regulation of climate and nutrient cycles as well as wood production, which benefit both nature and people. This is particularly important for forests under pressure from climate change and increased disturbances, affecting forest's health and resilience. Biodiversity is tightly linked to disturbances: A healthy and diverse forest is better equipped to recover from storms, fires, and droughts. At the same time, disturbances can have diverse effects on biodiversity, either leading to biodiversity loss or providing opportunities for biodiversity enhancement.

This brief highlights how biodiversity — in our case mainly focusing on different species of trees and plants — makes forests stronger and more adaptable. It also explores how disturbances and biodiversity are intertwined. Finally, you will learn how changes in forest management towards increased tree diversity can support both forest resilience and wood production while preparing for future challenges.

Photo: Marcus Lindner, European Forest Institute

RESONATE main findings

Why Biodiversity Matters:

- **Key to Resilience:** Forests with varied tree species and functional traits[1] are better equipped to withstand and recover from disturbances like storms and pests. Diverse forests are less likely to experience large-scale die-offs, as different tree species respond differently to stress.
- **Boosting Productivity:** Higher tree diversity can increase forest productivity, making it a strategic asset for wood producing forests.
- **Irreplaceable Forest Service:** Forest biodiversity is among the hardest ecosystem services to substitute, making its conservation vital for forest resilience and functionality.
- **Holistic Value:** Beyond utility, biodiversity holds intrinsic value and supports ecological stability, ensuring resilience for ecosystems and society alike.

What we can expect under climate change:

- **Effects of increased disturbances on biodiversity:** Natural disturbances like insect outbreaks and fires are increasing, making forests younger and more open. This can benefit some species (e.g. those who need light to grow) but may harm those that depend on old, dense forests.
- **Disturbances as Opportunities:** Natural disturbances can boost biodiversity by creating chances to introduce climate-adapted species.

1 Functional traits are different characteristics of tree species like how they use resources, how they grow their roots, how tolerant they are to e.g. drought.

RECOMMENDATIONS

For Policymakers (regional to EU level)

a. **Promote tree diversity:**
   - **Support forests with tree species mixture with different functional traits** to improve recovery from disturbances and make them more adaptable to climate change. Promote mixed forest with slow-growing broadleaved species and not only fast-growing conifers and support more mixture in coniferous stands.
   - **Foster the management of deer population to reduce browsing impacts**: Browsing can be a risk to tree diversity, because deer feed on specific species, e.g. oak.

b. **Promote forest management for structural diversity:**
   - **Foster natural regeneration** in an early state to support biodiversity.
   - **Advance uneven-aged forests** to increase resilience and to speed up recovery from disturbances.
   - **Promote deadwood retention** and other measures to increase the diversity of the forest structure, allowing multiple species to coexist by meeting their specific habitat requirements.

c. **Provide financial and training support for forest managers:**
   - **Develop training programs** for forest owners on how to manage forests in ways that benefit biodiversity and increase resilience.
   - **Offer subsidies or payments** to forest owners who take steps to improve biodiversity, such as planting diverse species or maintaining deadwood.

For Forest Owners and Managers

a. **Support ecosystem and economic resilience through diversity:**
   - **Diversify tree species** to reduce the risk of large-scale losses during extreme weather events.
   - **Balance biodiversity and timber production** by creating forests with a mix of tree types and structures that support different species.

b. **Use disturbances to spark biodiversity growth:**
   - **Retain natural features**: after storms or fires, leave some deadwood and fallen trees to support biodiversity and provide habitat for wildlife.
   - **Mimic disturbances** (e.g. via prescribed burning) as a forest management method to increase forest resilience and biodiversity promotion

c. **Diversify your measures:**
   - **Tailor your management to local needs**: Use strategies that work for specific regions and conditions, ensuring both biodiversity and economic goals are met.
   - **Set small forest patches aside.**
   - **Manage browsing efficiently.**
   - **Foster natural regeneration** in an early state to support biodiversity.

Consequences and Trade-Offs

- **Biodiversity vs. Timber Production:** Enhancing tree diversity may reduce short-term economic gains but builds long-term ecosystem stability and resilience.
- **Management Intensity:** High-intensity practices can reduce disturbance impacts but often harm biodiversity and multifunctionality.
- **Disturbance Legacies:** Retaining deadwood benefits biodiversity but may increase risks like pests or fires.
- **Regional Contexts:** Uniform strategies risk failure; local conditions must dictate which measures (e.g., species choice, disturbance prevention) are feasible and effective.
- **Set priorities:** Use zoning to balance priorities across the landscape.

RESONATE
Resilient Forests for Society

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