FORTRAN

The crucial role of old-growth forest for sustainable forestry

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We are losing biodiversity

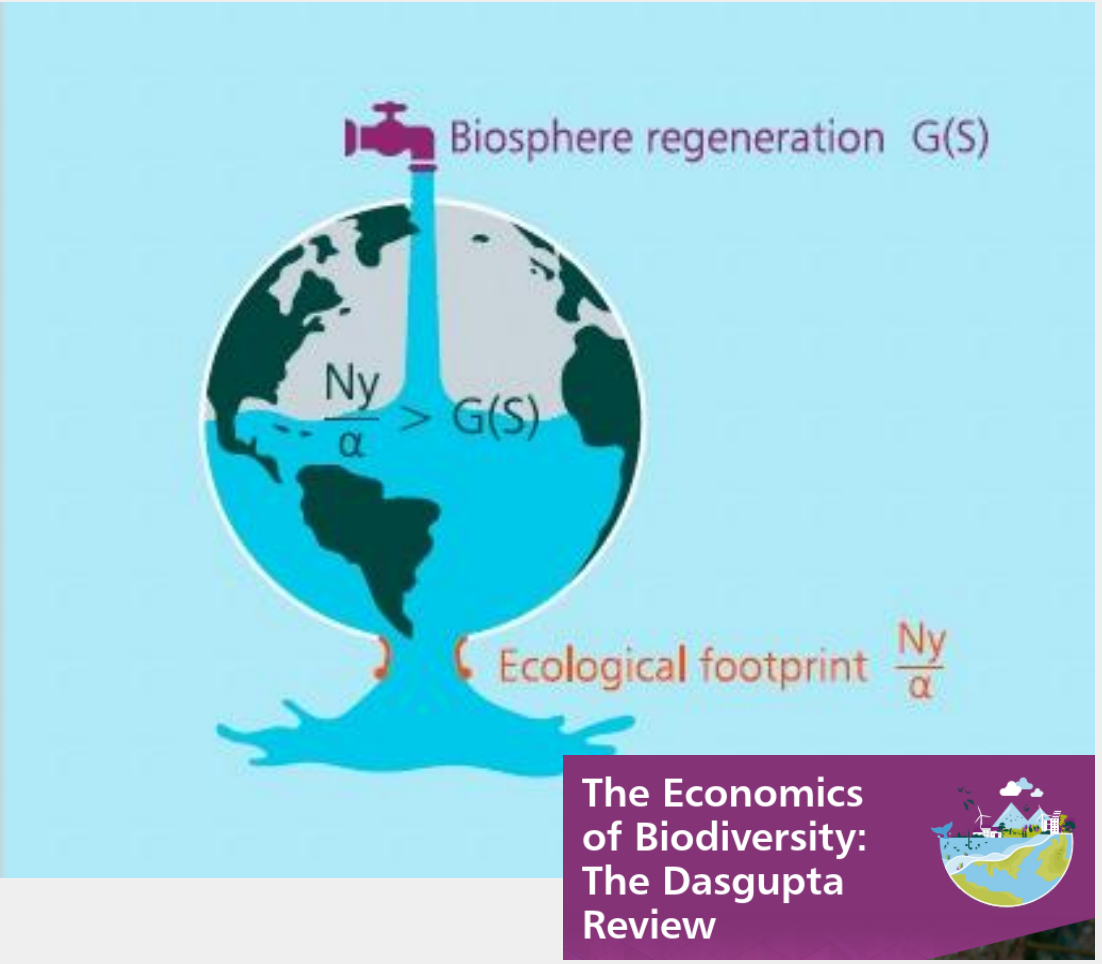
... because our demand for natural resources exceeds the regeneration rate (G) of natural capital (S)

Supply: G(S)

G	Rate at which the biosphere regenerates
S	Stock of the biosphere

Demand: $\frac{Ny}{\alpha}$

N	Human population
y	Human economic activity per capita
α	Efficiency with which the biosphere's goods and services are converted into GDP and the extent to which the biosphere is transformed by our waste products

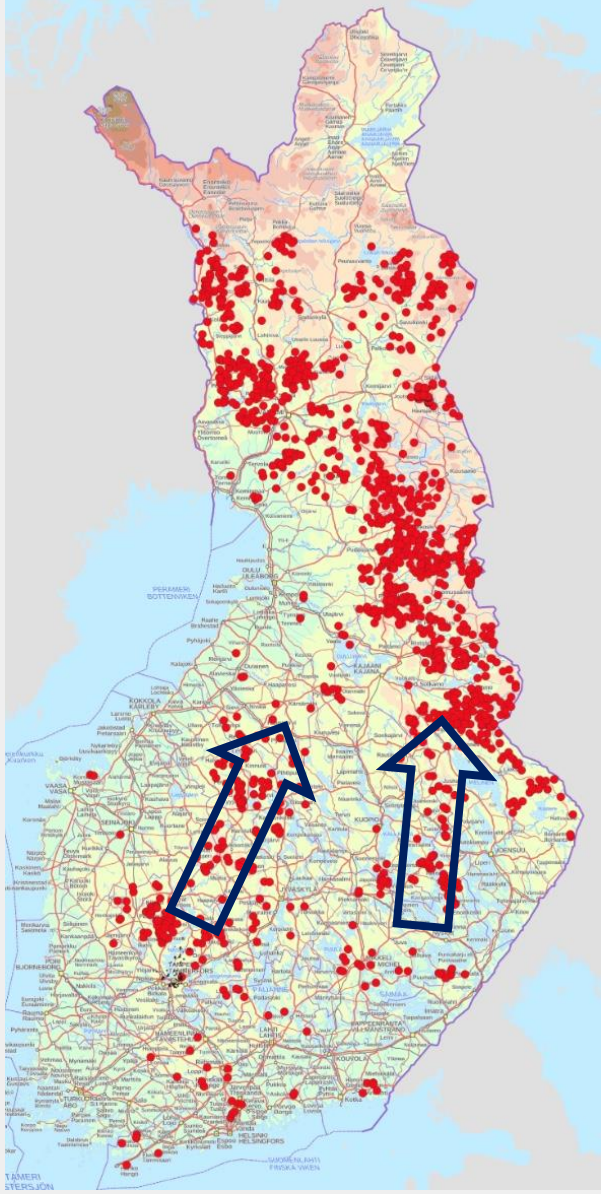


How to turn the trajectory?

- Decrease consumption (y) & #consumers (N)
- Increase material efficiency (α)
- Boost biosphere's regeneration capacity G(S)
  - Nature protection and restoration

Why do we need old trees & forests?

- Age is a proxy - many attributes important to biodiversity require time to develop but difficult to measure & communicate
  - ➢ Better to look directly at the attributes rather than age
- Biotic communities in old-growth forests (OGF) more resilient to climate change - connectivity in time
- Under climate change we need a connected network of OGFs – their continued availability in space is crucial



Unprotected old-growth and natural forests on public land

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https://koneensaatio.fi/tarinat-ja-julkaisut/valtion-mailta-loytyi-runsaasti-suojelemattomia-vanhoja-metsia/

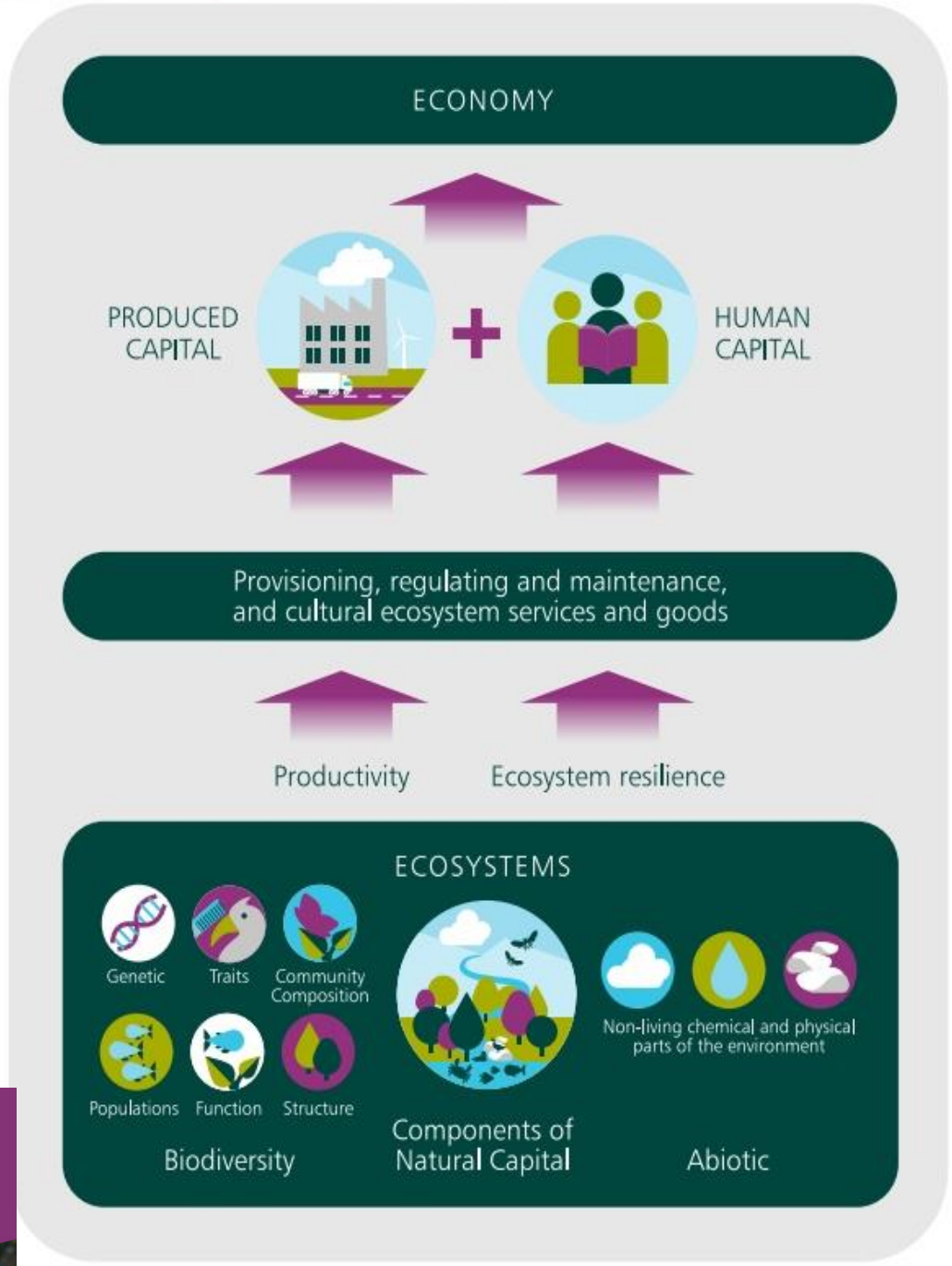
Why should we care about OGFs?

Natural (& human) capital

- Crucial for maintaining BD, i.e., ecologically sustainable forestry
- Large carbon storages (and a sink)
- Non-timber ecosystem services
- Tourism and recreation
- Cultural values
- Insurance values
- Our economies are critically dependent on natural capital
- As the natural capital is declining we are poorer and more in debt than the economic indicators (GDP) show

The Economics of Biodiversity: The Dasgupta Review

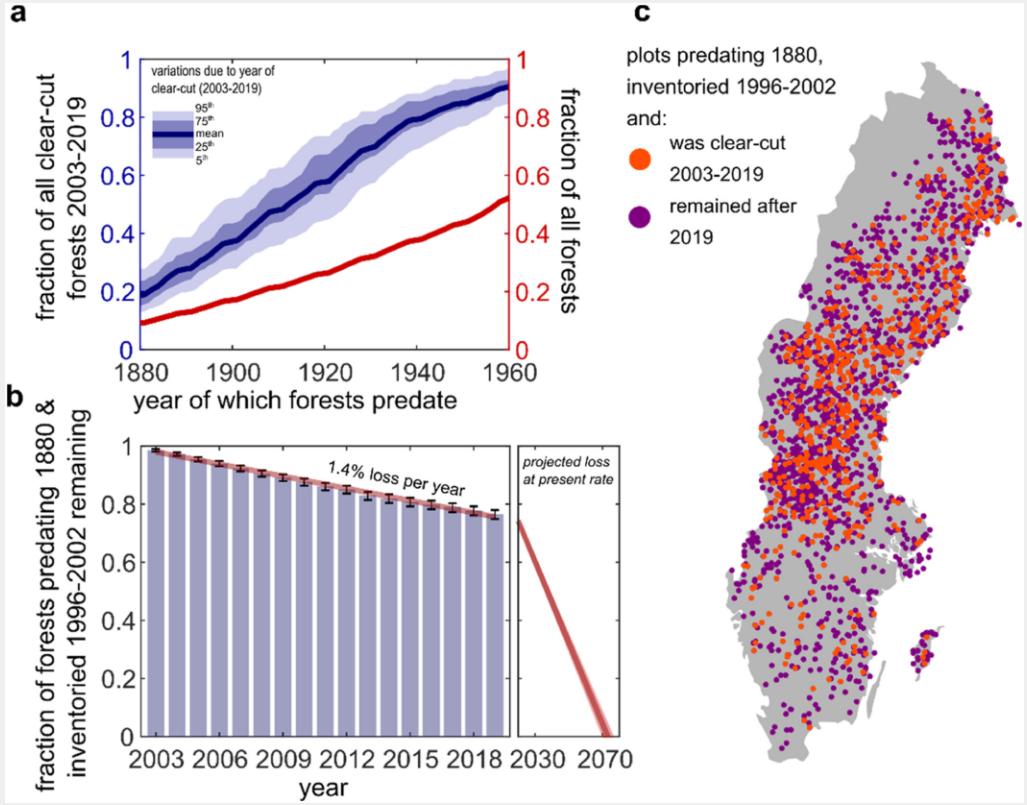
Figure 3 Links From Biodiversity to the Economy



Ecological condition of Finnish forests

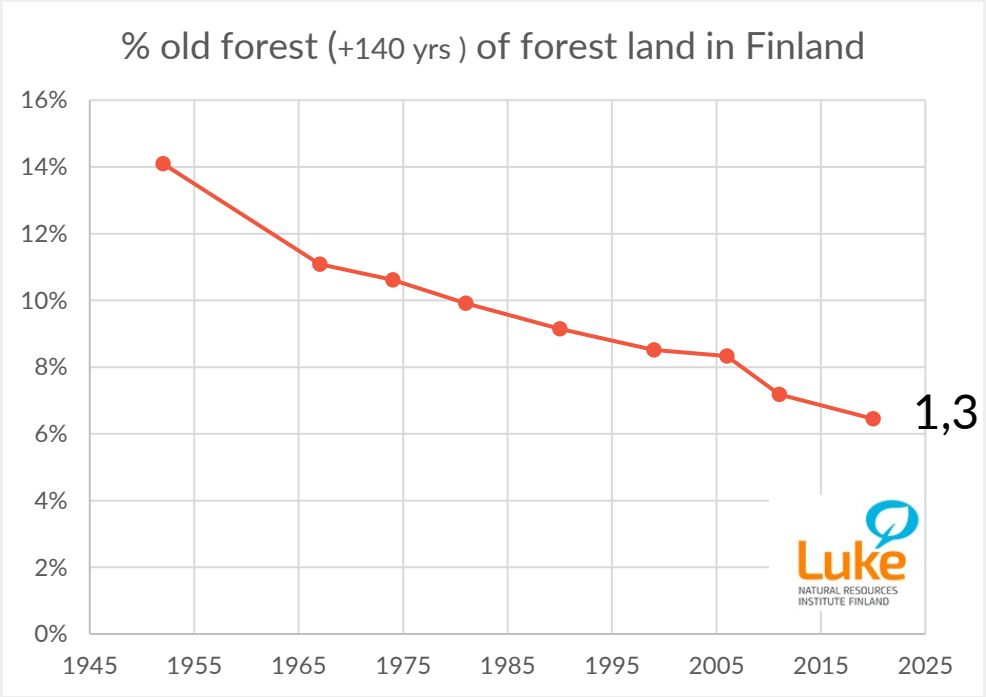
- >75% of forested habitat types are threatened
- 31,2 % of threatened species live primarily in forests
- The most significant reasons for endangerment of forest habitat types and species
  - reduction in old-growth forests (OGF) and individual old trees
  - reduction in coarse woody debris (deadwood)
  - changes in tree species composition – decline of deciduous trees

We are rapidly losing the remaining old-growth forests (OFGs) outside protected areas



Widespread Unquantified Conversion of Old Boreal Forests to Plantations

Earth's Future, Volume: 10, Issue: 11, First published: 28 October 2022, DOI: (10.1029/2022EF003221)



1,3 Mha

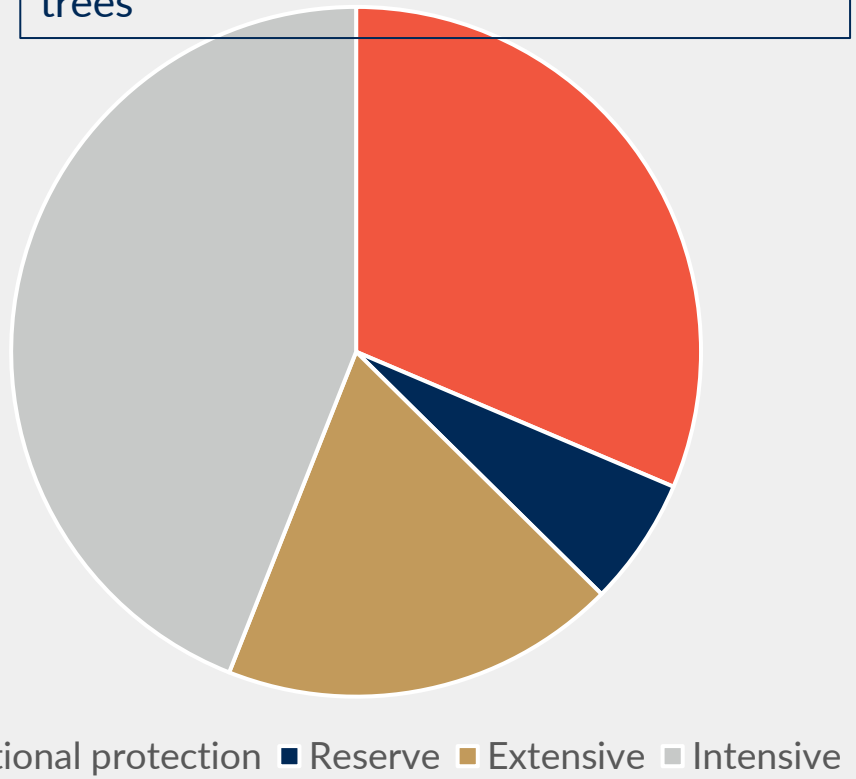
Forests in protected areas are getting older
→ Rapid decline in old forest area outside protected areas

Transversing these trajectories in forest characteristics is doable

It requires

- Changes in forest land use – more protected areas, more closer-to-nature management, less intensively managed forests
- Lower than current harvest level

Optimal landuse
Maximizes timber production with the constraint of achieving favourable levels of old forests, dead wood & deciduous trees



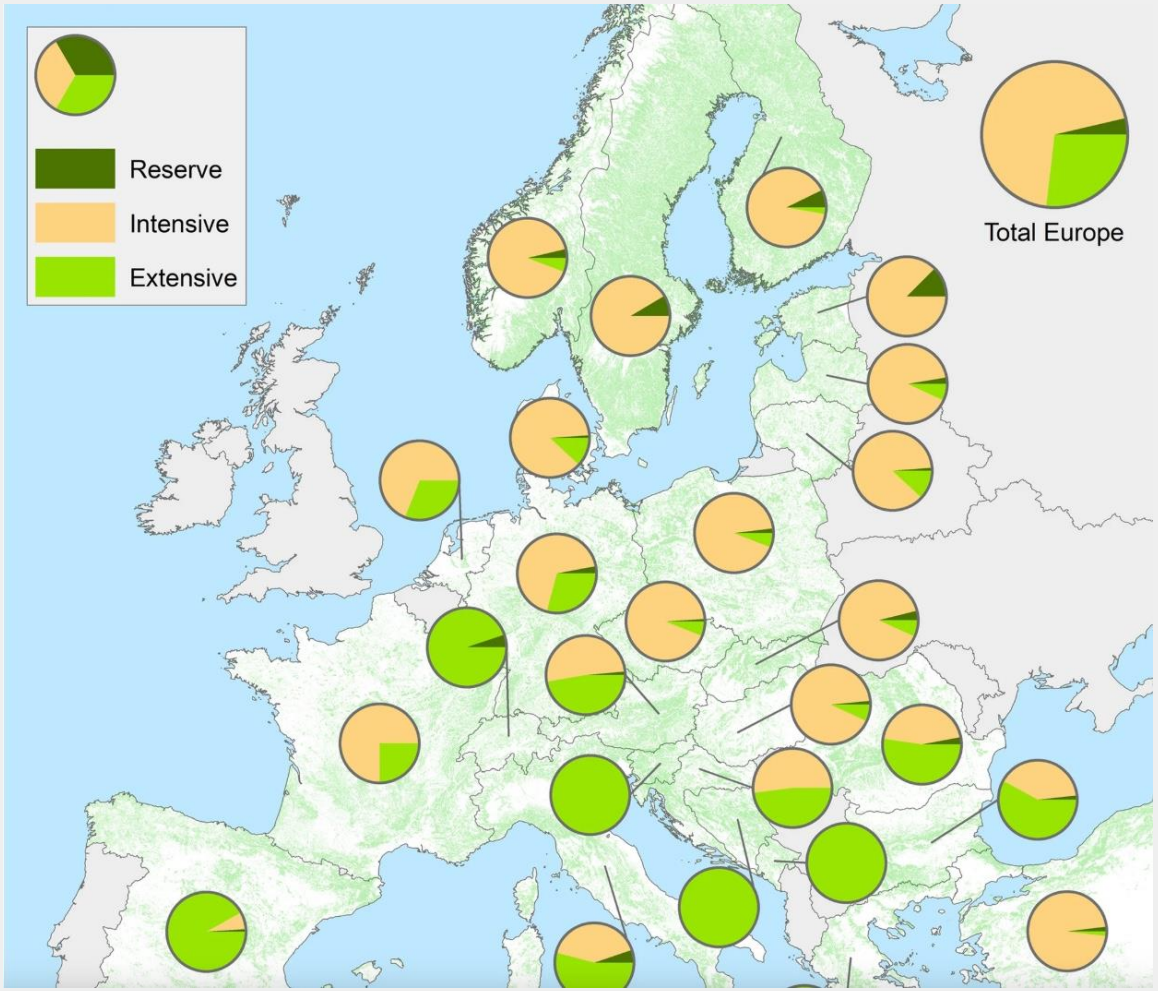
Old-forest cover is the most difficult characteristics to maintain in managed forests

→ conservation focus on existing and near-future* OGFs

***Near-future OGF** – Forests that currently are 100-140 yrs old but will soonish be OGFs

Mönkkönen et al. unpublished https://www.biorxiv.org/content/10.1101/2024.06.27.600997v1

Forest land use in Europe



Nagel *et al.* 2024 *Ambio*. https://doi.org/10.1007/s13280-024-02116-2

In boreal Europe

- Intensively managed forests dominate
- Low proportion of protected forest reserves – well below the levels in international agreements & policies

Further south

- Extensively managed forest (closer-to-nature) more common
- Forest reserves less common

Opportunity: we still have OGFs remaining for protection

Primary and old-growth forests outside of strict legal protection 2,2 to 2,8 million ha (Swedish Environmental Protection Agency, SEPA)

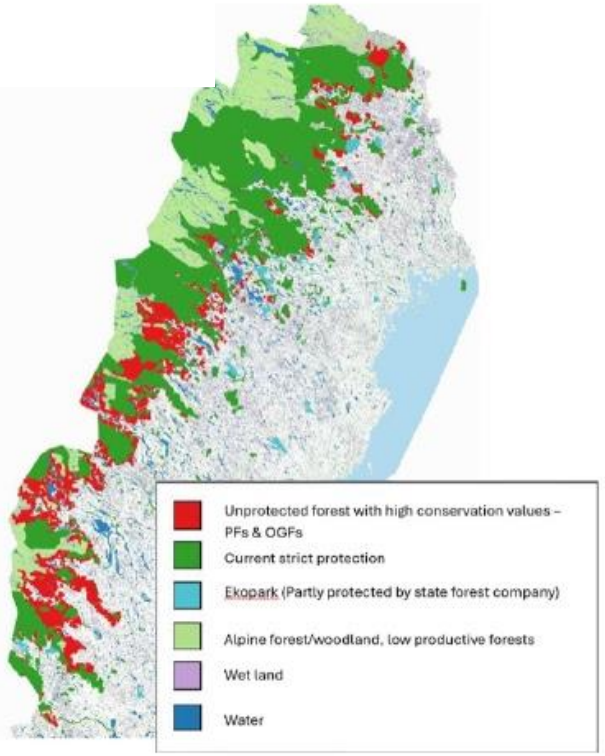
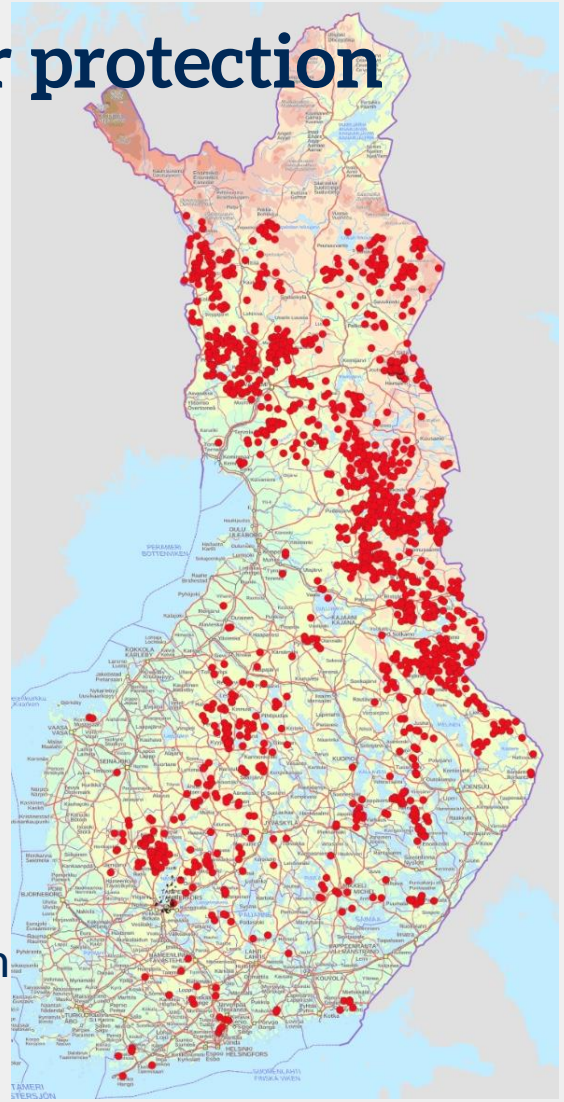


Figure 4. Map with the last unprotected primary and old-growth forest landscapes (red areas) in the north-west of Sweden and where forest management would fragment the intactness of the forest landscape. Suggested to be strictly protected by the former government appointed forest investigation in 2019-2020. Map produced by SEPA.

+700,000 ha unprotected old-growth and natural forests on public land

Private forests?



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Natural forest dynamics in boreal Fennoscandia: three basic types

- Strong stand replacing disturbances (fires)
- Partial, low intensity disturbances and cohort dynamics
- Gap & patch dynamics

Forest management emulates dynamics (structures) that was relatively uncommon

Pine 25 %; spruce 60 %

Pine 45 %; spruce 10 %

Pine 20%; Spruce 30 %

Old-growth forests are very diverse and complex in dynamics and structures

Kuuluvainen & Aakala 2011. Silva Fennica

Take home messages - OGF definition and mapping

Old-growth forests

- are the most limiting factor for ecologically sustainable forestry
- contain large economic & societal values

Forest age is a proxy for many important characteristics in forests

- but better to look at these characteristics directly: Dead-wood, tree-related microhabitats, stand complexity/variation in age ...
- A forest can be OGF even if most (dominant) trees are young
- Many forests that currently are 100-140 yrs old will soonish be OGFs, and thus, valuable in the current situation

Science-based definition of OGFs acknowledges the natural variation in forest structures

As the forest ecosystems and their landuse use history are rather similar in the boreal Europe, it would reasonable to have common – science-based - criteria and mapping methods for this region

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Thank you!

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