When is active management favourable for biodiversity? Examples from projects in temperate deciduous forest in Sweden and Norway

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The Swedish Oak Project – Effects of Moderate Harvest of Biofuel in Temperate Deciduous Forest (long-term project started in 2000 and ongoing)

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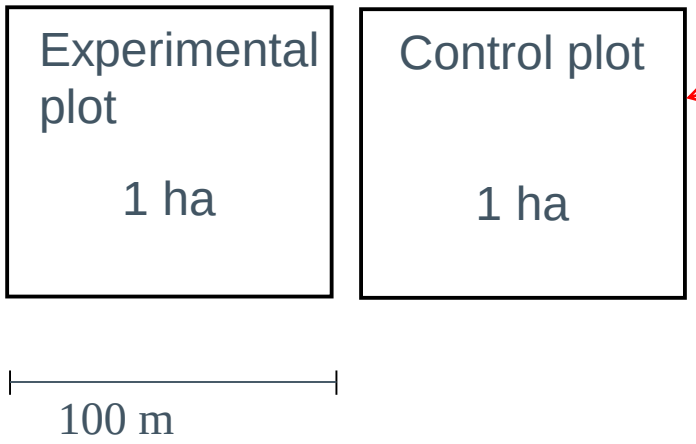
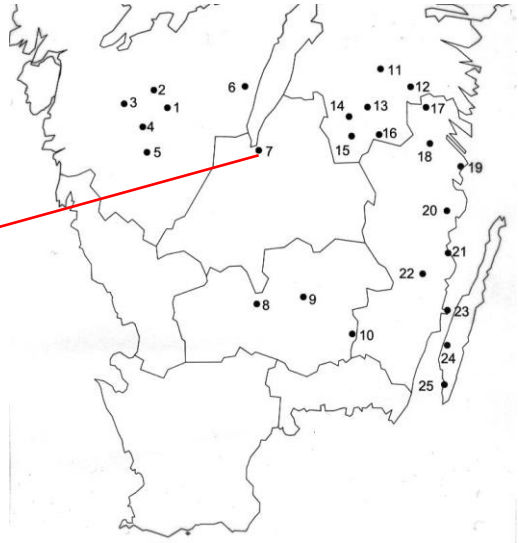
Mixed Temperate Deciduous Forest dominated by oaks

- Usually history as oak woodland pasture, now mostly overgrown (Picea, Betula, Fagus et c)
- Decreasing, threatened, species rich forest type

Study design = BACI (before-after, control-impact)

- Surveys before and after cutting
- 25 sites





Well-replicated design allowing for the comparison of differences of change (before minus after) between control plots and treatment plots.

Short-term effects (up to 8 years) of partial cutting (total species richness)

+


Lichens on oak bark


Vascular plants


Herbivorous beetles


Wood-inhabiting beetles


Lichens on dead wood


Forest floor bryophytes

+/–


Dead wood Ascomycetes


Dead wood Bryophytes


Fungus gnats (mycetophilids)


Fungi on newly created coarse oak logs

–


Wood Basidiomycetes


Land molluscs

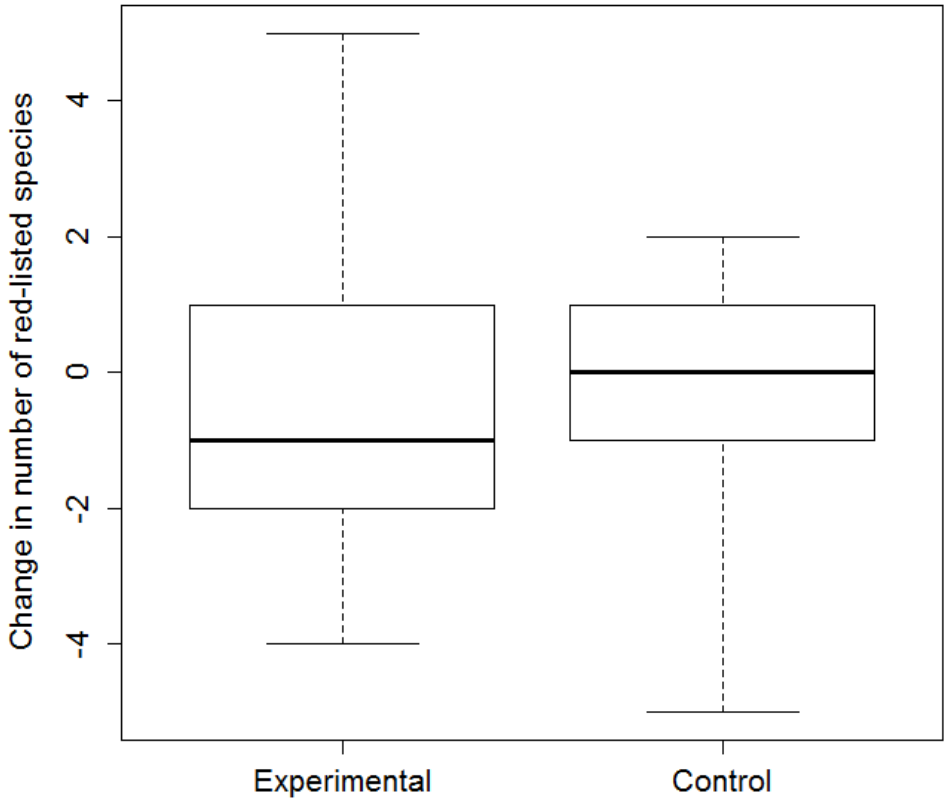
In total > 2500 species

\+ Growth and regeneration of oaks favoured

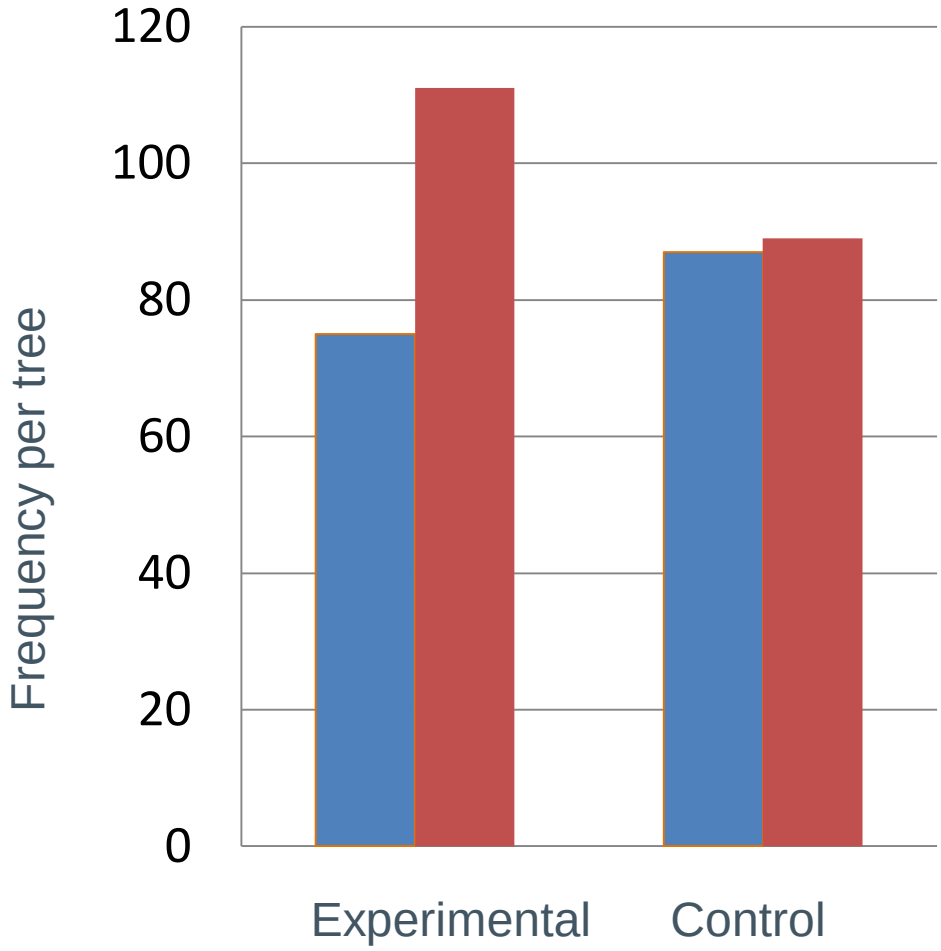
Change in total number of red-listed species

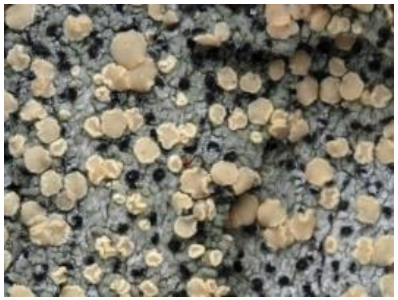
Before cutting:
On average
4 red-listed
species/1 ha
plot
(n= 19 study
sites)

Slight decrease
mainly driven by
red-listed beetles
(and a few RL wood
fungi); medians not
significantly
different



Red-listed and indicator lichen species: frequency per oak tree





Conclusions, the Swedish oak project

Mainly positive or neutral (short-term) effects for biodiversity…

but a smaller part of the area should be left unmanaged to favour wood-decaying fungi, land snails et c

The forest type, mixed forests dominated by oaks, often present in protected areas, need management to preserve and devolop its conservation values

Do pollarded trees support a higher species richness of lichens, bryophytes and fungi than large non-pollarded trees? (Pollarding, is it worth it?)

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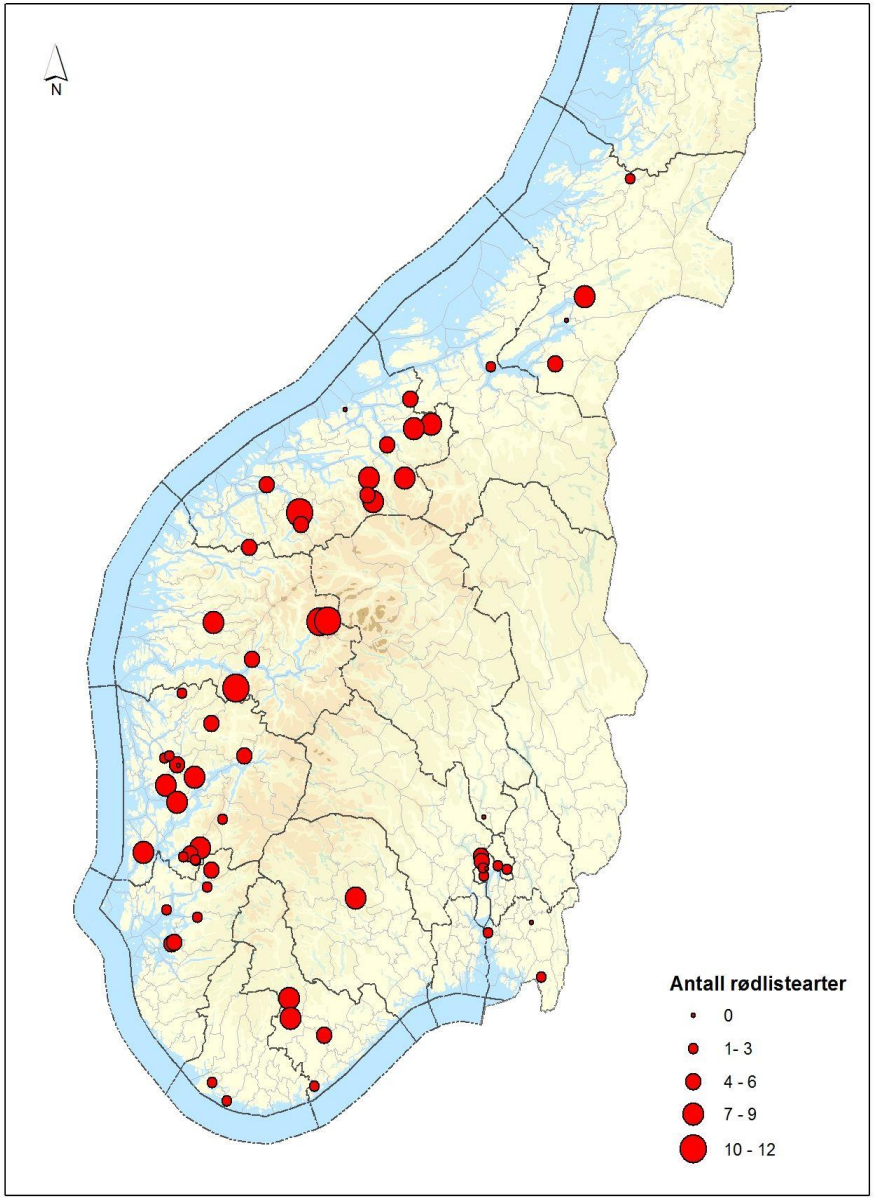
Study of old *Ulmus glabra* and *Fraxinus excelsior* in Norway

Study sites; sizes of dots according to the number of nationally red-listed species.

66 sites, as many with pollarded as with non-pollarded trees (n=350).

Sites with varying canopy closure.



Only trees with a dbh > 40 cm were surveyed. A non-pollarded *Ulmus*

0 – 2 m on trunks surveyed, branches > 10 cm diameter

Lichenized fungi

Lichen-associated fungi

Bryophilic fungi

Wood-living fungi

Bark-living fungi

Bryophytes

Some results (linear mixed models, LME)

474 species, 49 nationally red-listed

Pollarded trees larger than non-pollarded trees

Pollarded trees had more trunk cavities than non-pollarded trees

Pollarded trees did not support a higher total number of species

Pollarded trees had a higher number of red-listed non-lichenized fungi. (Nearly all species also use dead and fallen trees)

…But not a higher number of red-listed lichenized fungi

(Bryophytes showed little effect and only one red-listed species)

The number of red-list species per tree did not decrease with the amount of spruce (p = 0,644) or with increased canopy cover (north-facing p = 0,074; south-facing p = 0,336).

BUT epiphytes and trees do suffer in dense spruce plantations, so in such cases cutting of spruce around old *Ulmus* and *Fraxinus* should be part of management.

Conclusions

Based on our results, we conclude that the value of (re-) pollarding as a conservation effort can be questioned, at least for epiphytic cryptogams in Norway

The non-pollarded trees can probably replace the ecological function of the pollarded trees regarding epiphytes

General conclusions

Recent research highlight the need for management in certain forest types within protected areas in order to maintain and/or restore conservation values. An example of this is restoration cutting in oak-dominated forest.

However, other practices, such as (re-)pollarding of temperate deciduous trees, can be questioned in some cases.

TransForest, Norwegian research council 2016-2020

Transformation of recent forest on abandoned agricultural land for the benefit of biodiversity, ecosystem services and green solutions

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Background

Temperate deciduous forest the worlds most declined biome.

Possibility and some trends of increase on abandoned agricultural land.

Often mixed and dense forest with conifers (spruce).

Dense forest unsuitable for many declining (red-listed) species as well as for oak regeneration et c.

Temperate deciduous trees better adapted to future climate, and with higher energy value than spruce.

TransForest, rationale for the project and research questions

We study recent (50-80 years) mixed forest with temperate deciduous forest trees (esp *Fraxinus*) on abandoned agricultural land, some within protected areas

Can such forests be used with the combined goals of temperate deciduous forest restoration and biofuel production?

… increasing the future area of temperate deciduous forest with semi-open canopy?

Modified coppice with (eternal) standards

Study of the economy for landowners, machines, carbon budgets, need for policy and subsidies

14 sites in Norge and 14 in Sweden (+ 12 sites from the Swedish oak project, with *Fraxinus* for growth studies).

One experimental plot and one reference plot per site, each 100 x 100 m surveyed before (2016), and after (2019) restoration cutting.

Studied <u>organism groups:</u>
Vascular plants, Hoverflies, Wood-decaying fungi, Homoptera, lichens

Also studied: Response of ash dieback and oak powdery mildew