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Mechanical site preparation as a measure to increase the regeneration success of planted conifers in Fennoscandia

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Mechanical site preparation (MSP)

→ Using mechanical machinery to remove vegetation and humus layer exposing the mineral soil, and/or mixing humus and mineral soil, in order to improve establishment conditions for forest regeneration

- Sweden: > 90 % of the regeneration sites are treated with MSP
- Finland: ~65 %
- Norway: < 20 %

Photo: Kjersti Holt Hanssen

Potential benefits of mechanical site preparation

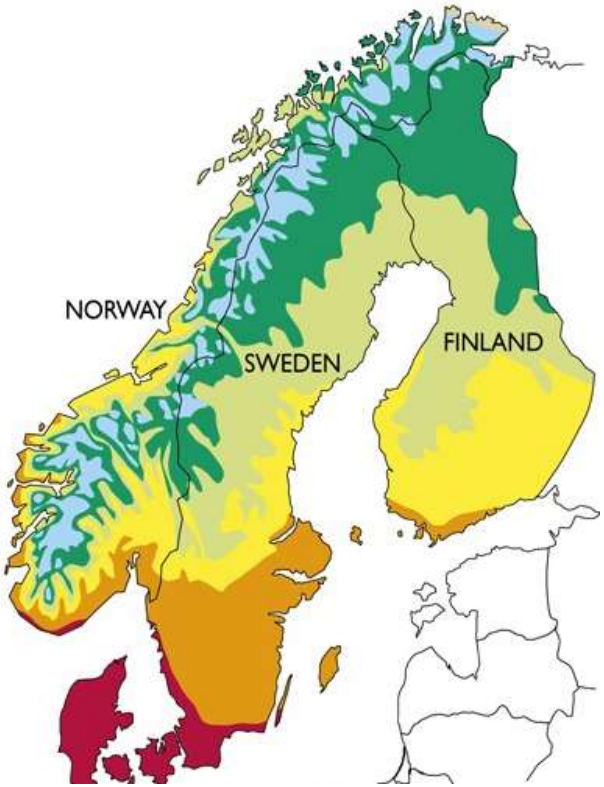
Our research focus:

What is the quantitative effects of site preparation in terms of survival and growth of planted seedlings?

- Faster establishment
- Increased survival
- Increased growth

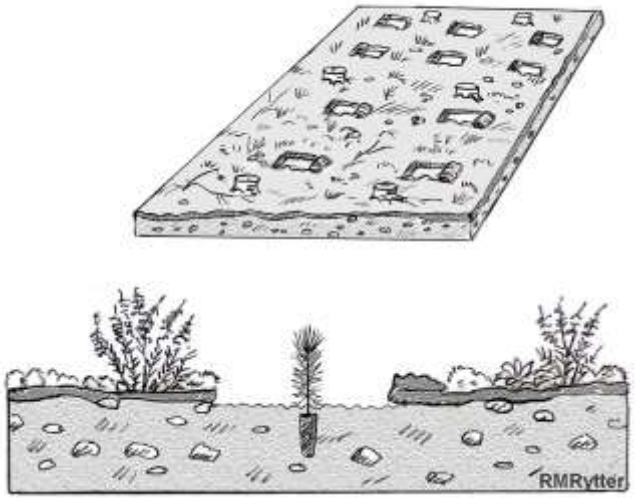
Our study

- Data from 36 studies in total were included
- Field studies conducted in the boreal, nemo-boreal and nemoral vegetation zones of Finland, Norway and Sweden
- Norway spruce (*Picea abies*), Scots pine (*Pinus sylvestris*) and lodgepole pine (*P. contorta*)
- Covering at least three growing seasons (3-18)
- Sites on mineral soil
- Temperature sums (degree days, treshold 5°C) were computed for all sites

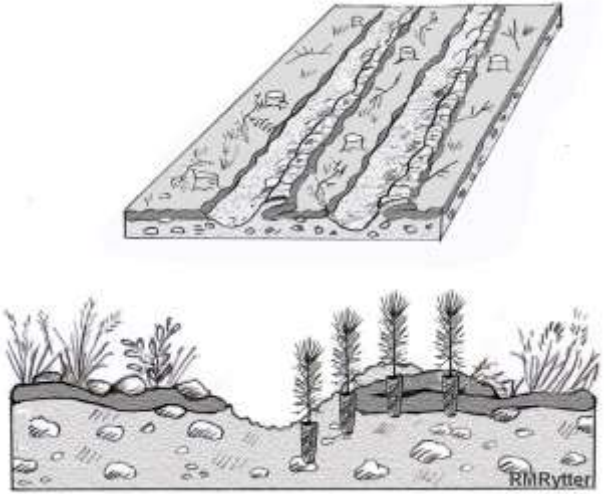


MSP methods and equipment:

Patch scarification



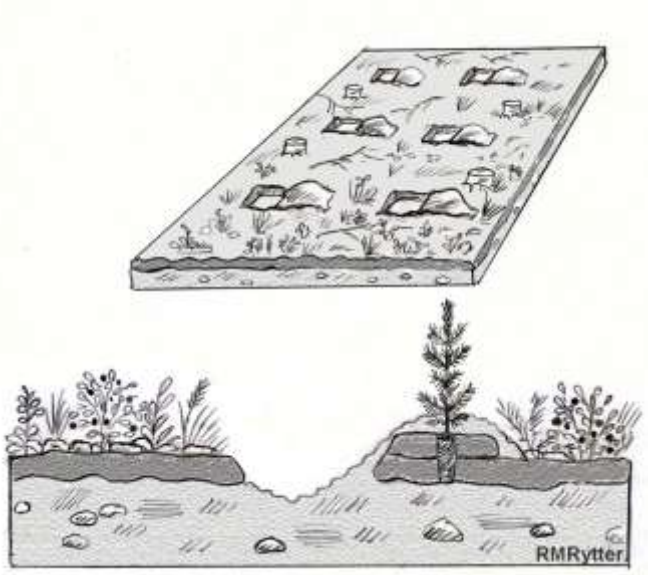
Disc trenching



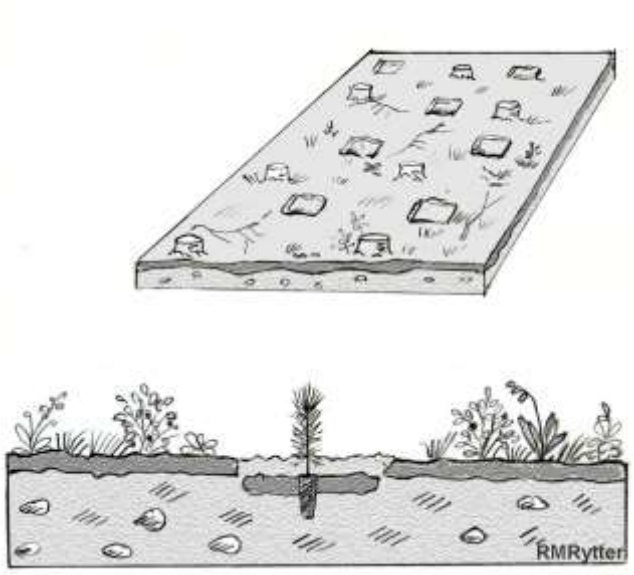
Ill: Rose-Marie Rytter

MSP methods and equipment II:

Mounding



Inverting



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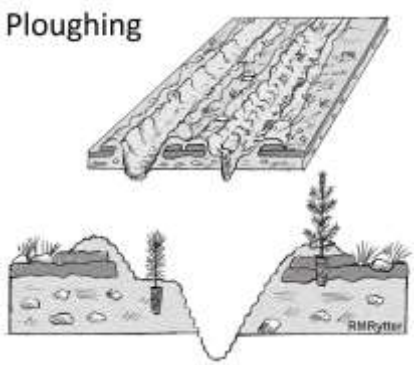
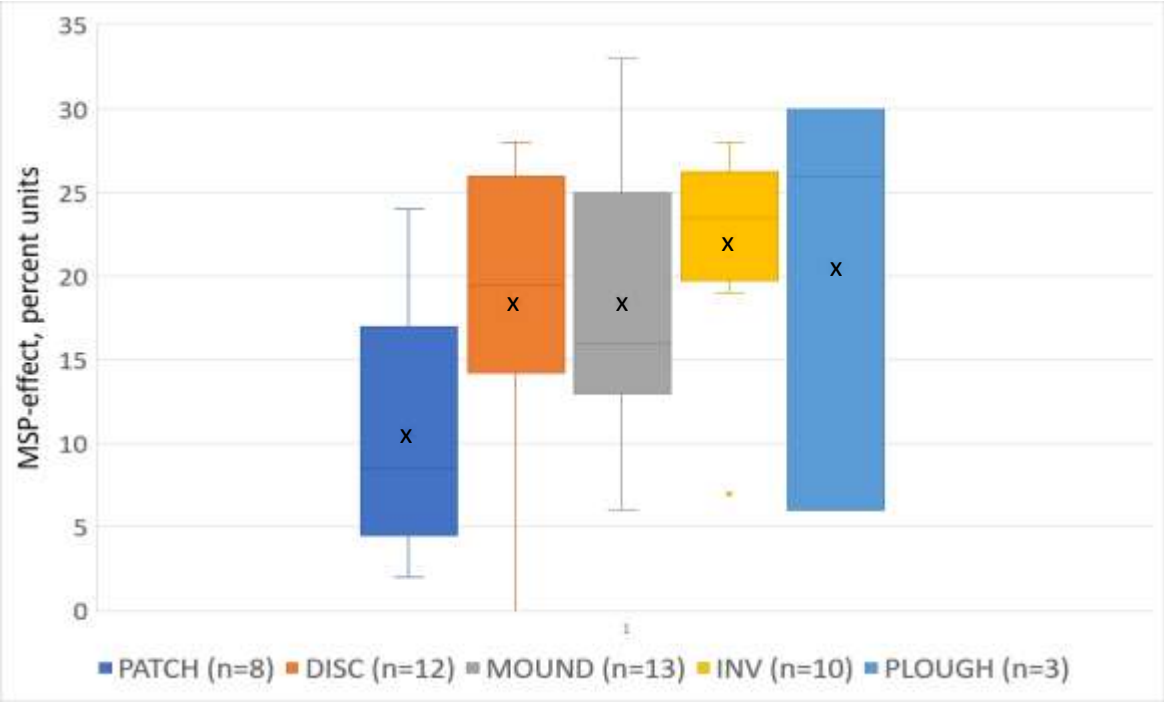


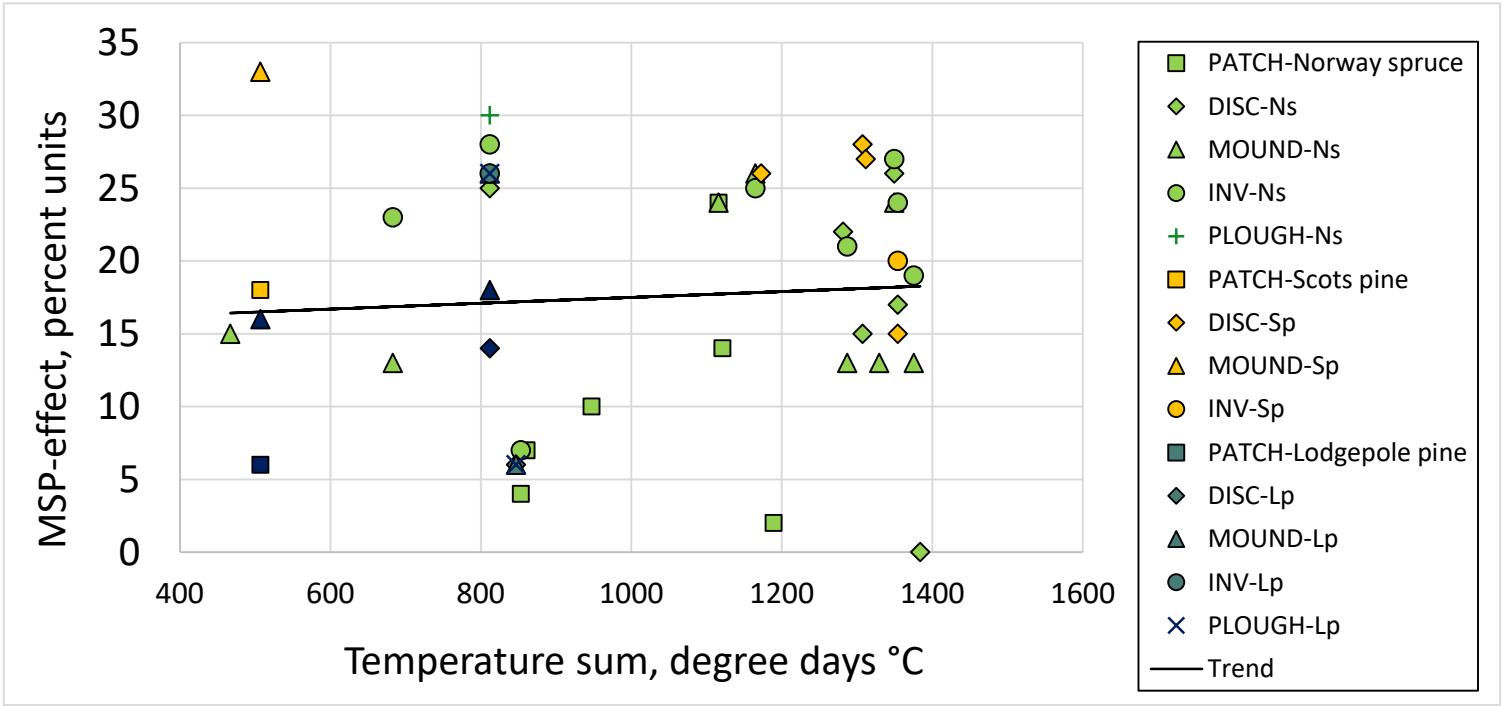
Effects on survival



Effects of site preparation methods on survival, compared to controls without MSP

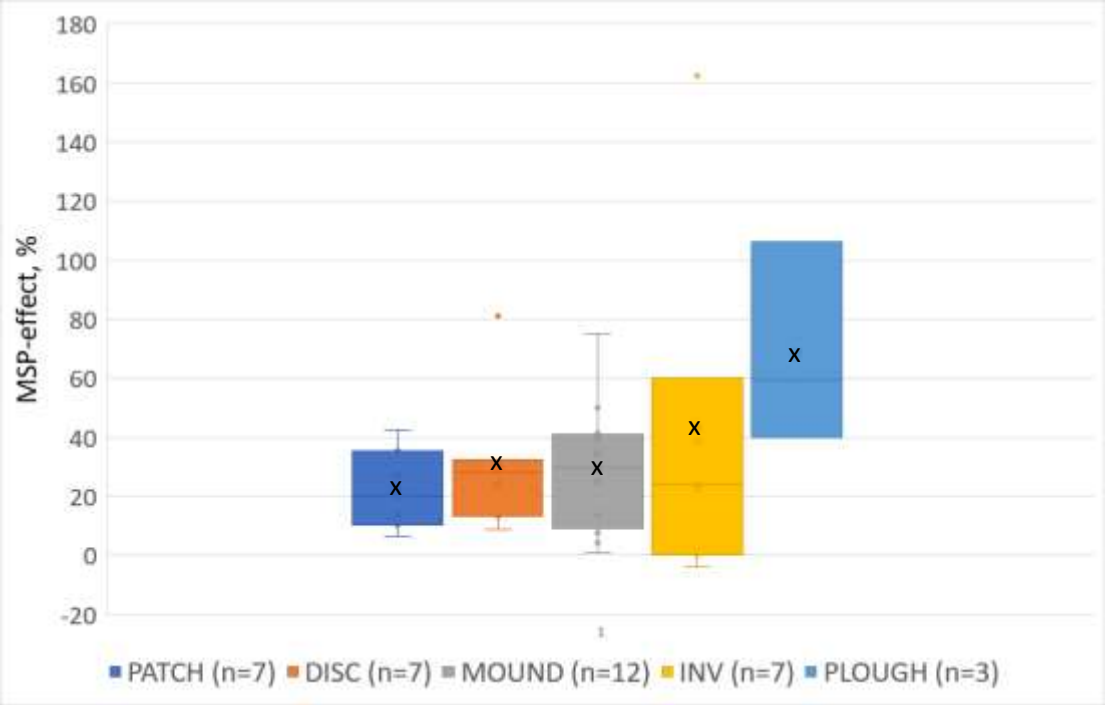
- Large variation between sites
- We can expect 10-20 % better survival on average
- Somewhat smaller effect of patch scarification

MSP-effect on survival vs. temperature sum



- No effect of temp.sum ($p = 0.57$)

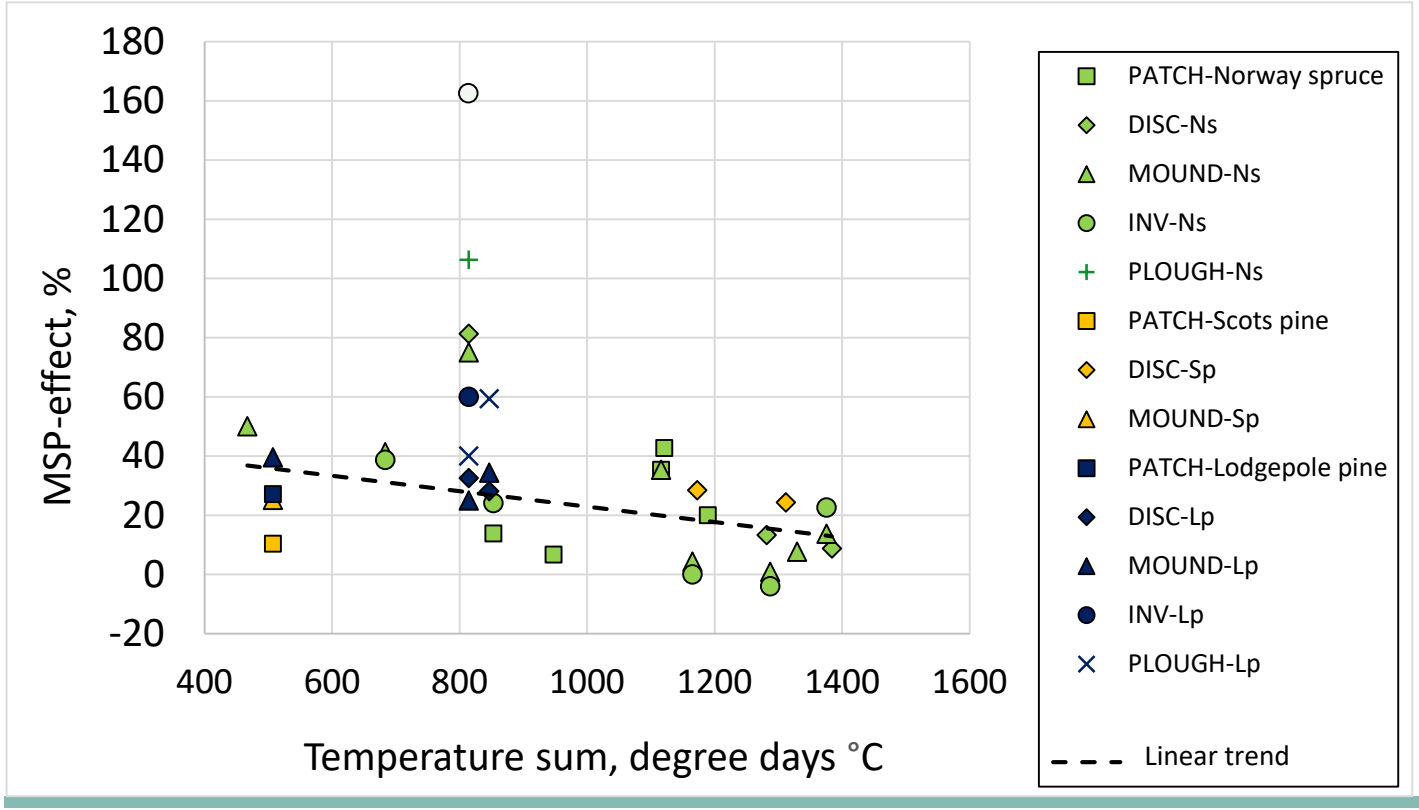
Effects on height growth



- Variation between sites
- We can expect 20-30 % taller seedlings on average

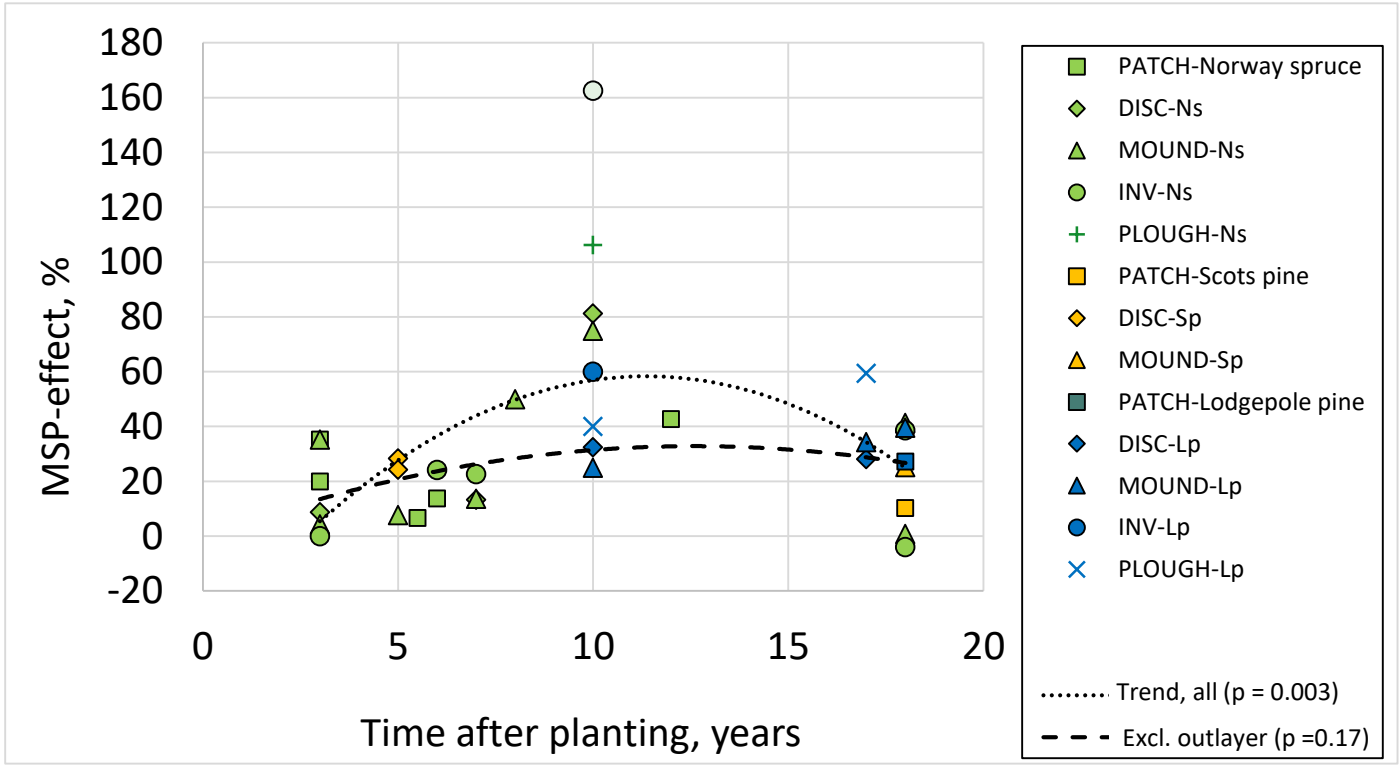
Effects of site preparation methods on sapling height, compared to controls without MSP

MSP-effect on height growth vs. temperature sum



- Effect of temp.sum ($p = 0.007$, $R^2 = 0.25$, outlier removed)

MSP-effect on height growth vs. time after planting



- Height growth increase may be temporary – lasting the first 10-15 years
- After that, the absolute height difference persists, without further increase

Summary - research focus and challenges

Research focus:

– We wanted to quantify the effect of mechanical site preparation

→ successful and cost-efficient reforestation is essential for sustainable forestry

Key challenges:

– Focus is often on minimizing the cost of each regeneration measure rather than optimizing the cost-effectiveness of the entire regeneration chain

Addressing the challenges:

– Field trials, comparative studies and predictive models are needed to design and evaluate different regeneration chains


Thank you for
the attention!
Photo: Erling Fløistad, NIBIO