

Even- vs. uneven-aged silvicultural management in the Nordic European countries - a case of Finland

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History in short in the Nordic Countries

- Selection cuttings until 1850
- Selection cuttings, dimension cuttings and even-aged management during 1850-1950
- Selection cuttings illegal or actively hindered

Time before large-scale sawmilling

- Slash-and-burn cultivation, fires often escaped
- Tar burning, coal burning
- Fencing of fields against cattle grazing in forest
- Fuelwood
- Logs for buildings
- The scenery quite open around villages, large wildernesses remained untouched

Large-scale sawmilling industry since 1850

- Dimension cuttings
- At first large diameter-limit, excellent quality, close to waterways
- Then smaller diameters, longer distances, poorer quality

Large-scale fiber industry since 1920

- Great need for conifer wood
- Smaller dimensions and poorer quality accepted
- Repeated cuttings at short intervals
- Often the whole forest area treated
- Sustainability poor

Concern about dimension cuttings

- Risto Sarvas, future professor of silviculture, conducted a study in 1938-1944
- Material very heavily dimension-cut areas
- Regeneration abundant, 5000 seedlings per ha
- Volume increment low in stands cut too heavily

After the war

- Increased need for raw material
- Believed that selection cuttings cannot provide enough pulpwood
- Even-aged management was selected
- A difficult decision, with no time for studies
- Dimension cuttings were banned
- Similarly, all kinds of selection cuts were banned
- They were regarded as clear negative selection
- The ban was forced effectively to practice

Later

- Natural regeneration and clear-cuttings were directed to over-aged and slow-growing stands
- Nursery techniques developed
- Soil preparation became fast and effective
- Clear-cuttings became more and more common
- Manual cutting and hauling with horses ended
- Efficient harvesters and forwarders came instead
- Large-scale ditching of peat land
- Wood production started to increase
 - 55 mill. m³ in 1955
 - 100 mill. m³ in 1999

Negative features

- Higher production due to ditching, afforestation of agricultural land, and higher stand volumes
- Planting costs high, particularly for poor sites in remote areas -> **low overall profitability**
- Loss of diversity, low tree quality, negative changes in landscape
- Continuous forest cover gained popularity
- Clearing of understory a prerequisite for thinning
- Natural regeneration almost prevented
- Promising results of uneven-aged management from abroad

Scandinavian results not promising

- Studies in pure uneven-aged spruce stands
- Uneven-aged structure has been maintained in half of the experiments for 30-70 years
- Regeneration slow, as well as increment of seedlings
- Wood production 80-85% as compared to even-aged management
- NPV 60-100% as compared to even-aged management
- Reasons for the strange results:
 - The studied stands had passed financial maturity
 - Regeneration was assumed to be minimal

Finnish studies

- During 1950-80 studies of uneven-aged management were prevented as unnecessary and harmful (no financing, no promotion)
- Our research team has been active since early 1980
- High number of experiments have been established, monitored and reported
- In 2007 Prof. Timo Pukkala, University of Eastern Finland, joined our team
- Since then the results are based on modeling and other modern methods

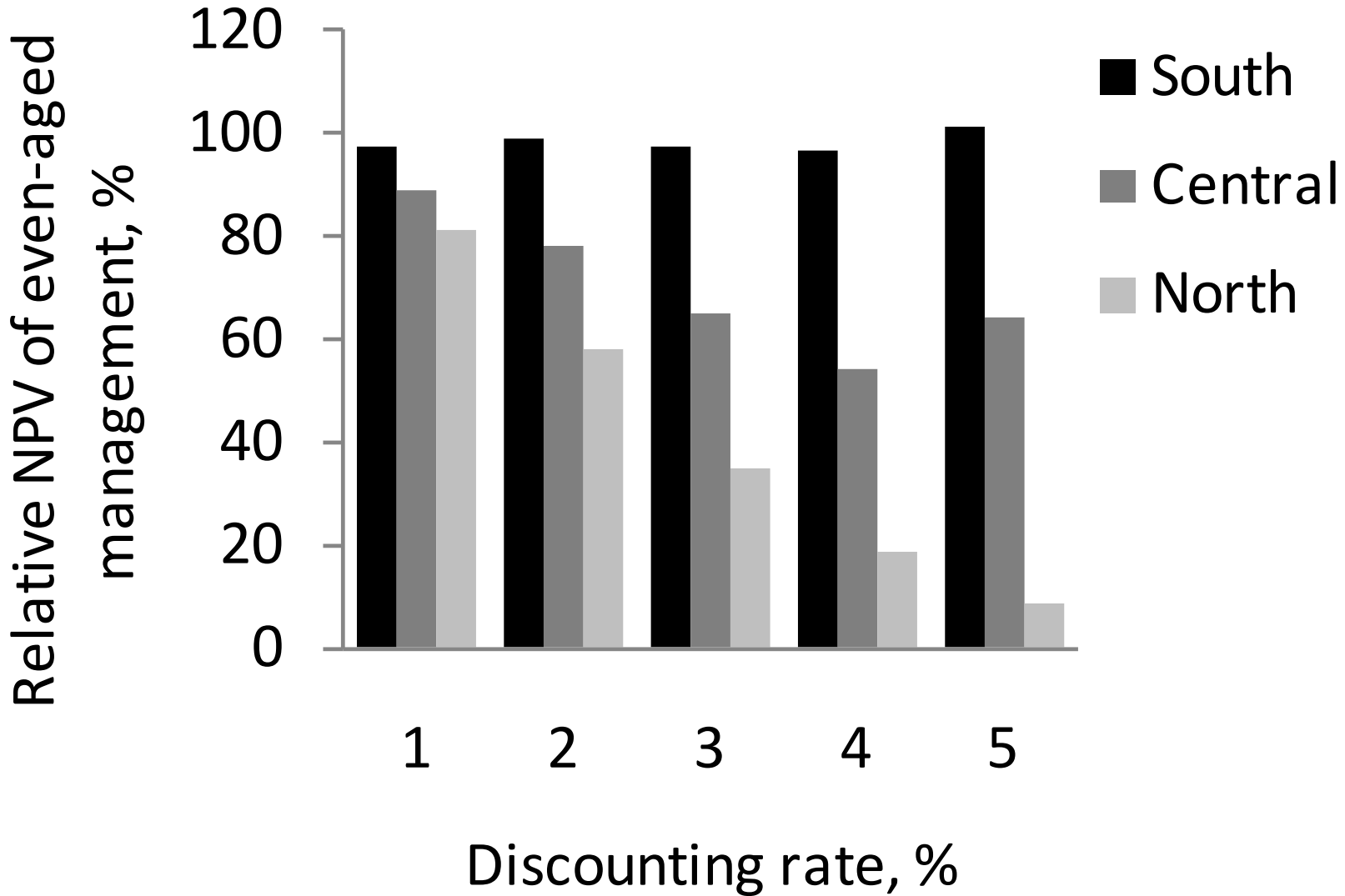
Growth and yield models for uneven-sized forest stands in Finland. For. Ecol. Manage. 258 (2009) 207-216. Timo Pukkala, Erkki Lähde, Olavi Laiho

- 104 spruce-dominated plots, Western Finland, monitored for 15 years, 17000 observations
- 158 pine and spruce plots, Eastern Finland, 12000 observations
- 2040 plots of the third NFI, sample trees from all over the country, 23000 observations
- Scots pine, 15000 observations
- Norway spruce, 24000 observations
- Birch, 8000 observations

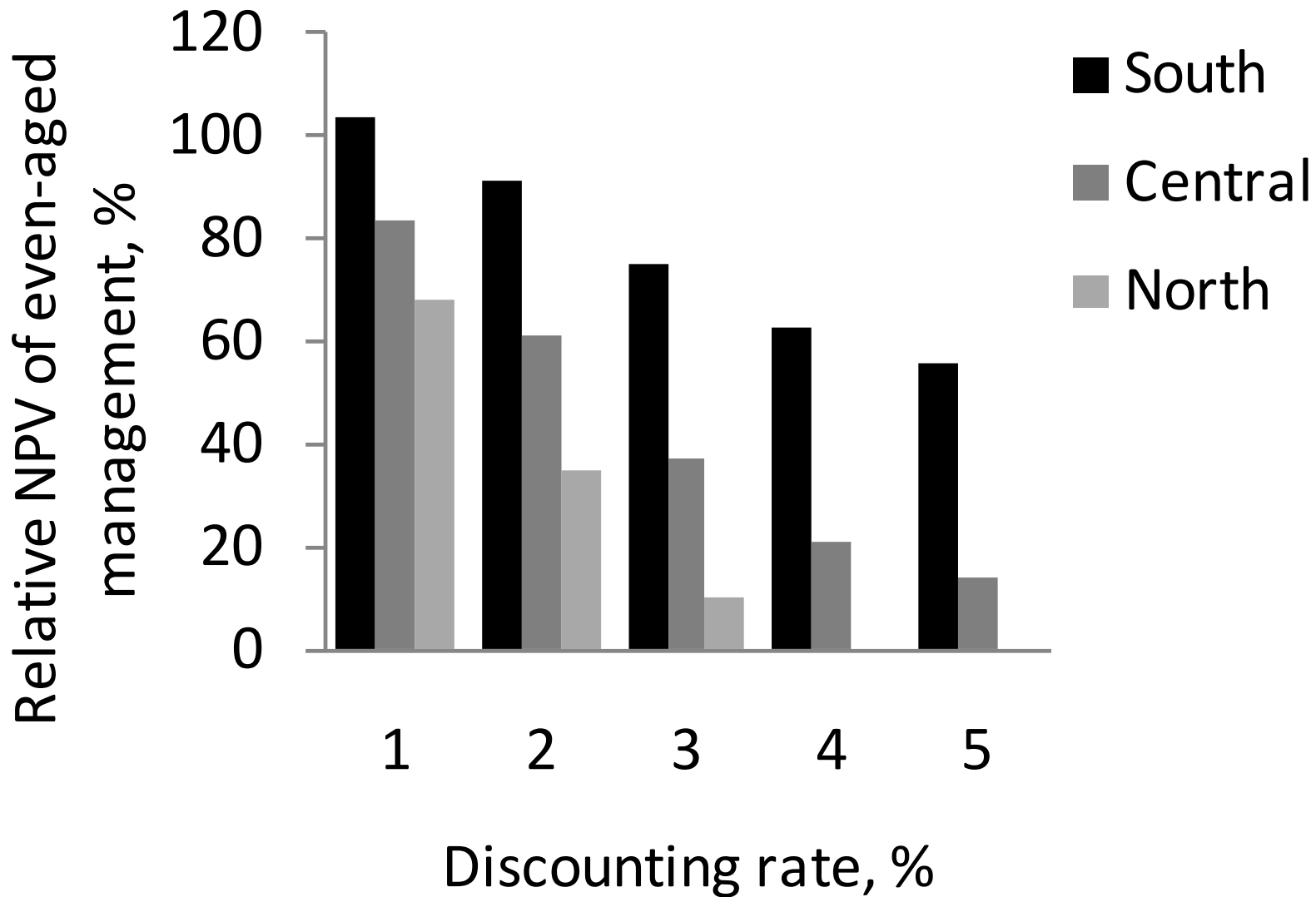
Optimizing the structure and management of uneven-sized stands of Finland. Forestry 83 (2010): 129-142. Timo Pukkala, Erkki Lähde, Olavi Laiho

- On the best site in South Finland even-aged forestry equals in NPV to uneven-aged forestry
- Lower fertility, northern situation, and higher discounting rate favor uneven-aged forestry

Spruce OMT

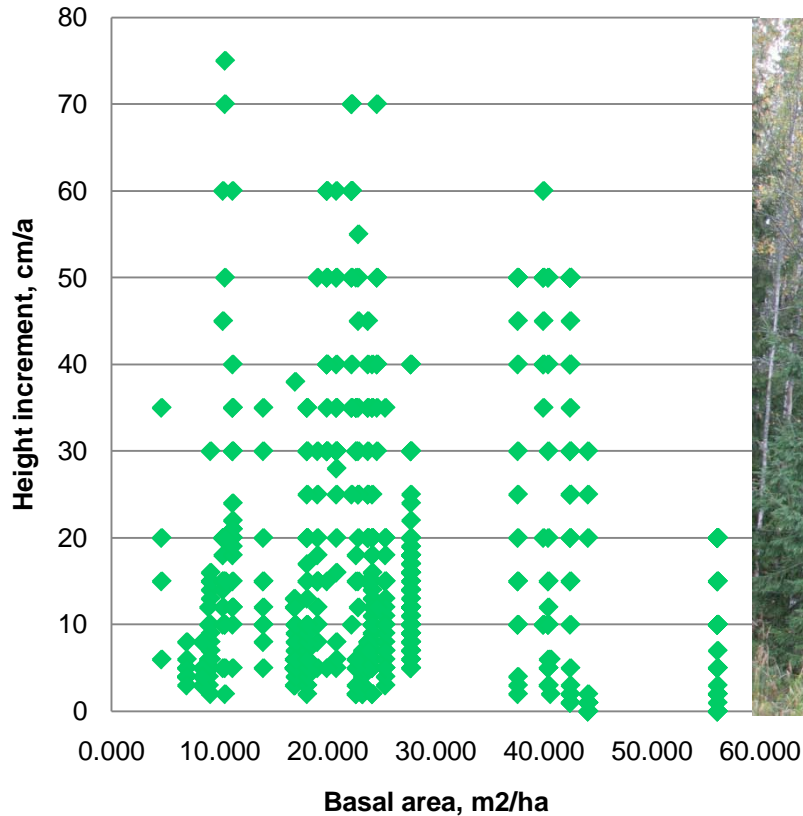


Spruce MT



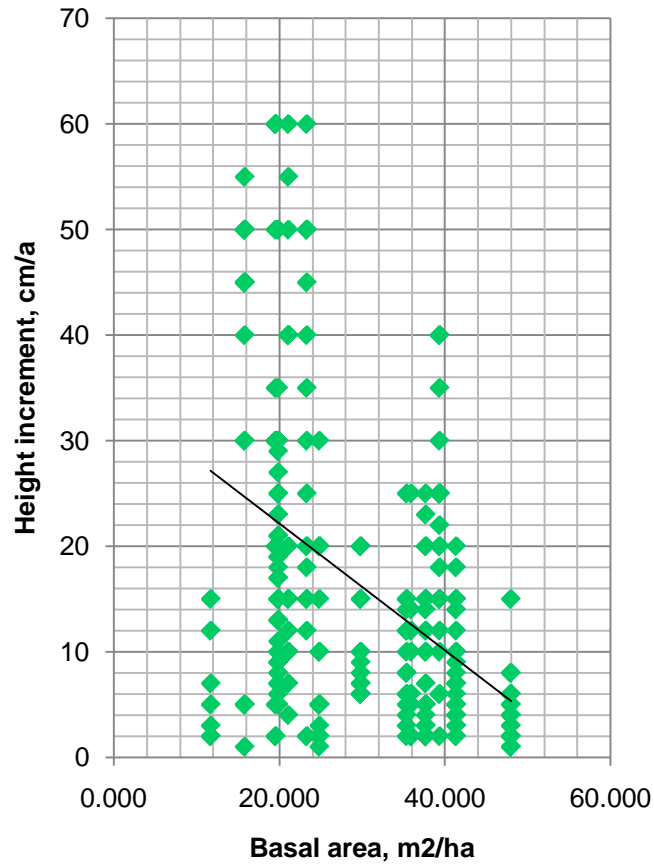
Dominant layer birch, understorey spruce

- Spruce under birch



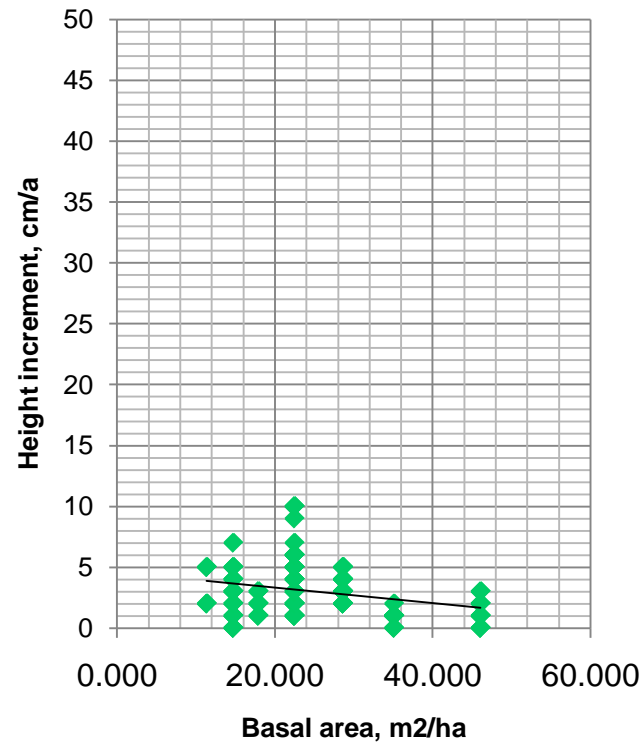
Dominant layer pine, understory spruce

- Spruce under pine



Dominant layer spruce, understory spruce

- Spruce under spruce



Situation today

- In Norway: Uneven-aged forestry actively practised with good results by Glommen Skog Ltd
- In Sweden: Uneven-aged forestry not illegal but hindered. Textbook available by Mats Hagner
- In Finland: Legalization discussion underway, good hope of positive outcome

Conclusion

- Main storey formed by pioneering species with climax species under storey very rewarding to start uneven-aged management
 - Without heavy cuttings, a climax species becomes gradually dominant and finally the only species
 - In the case butt rot, growth and regeneration slow down => the stand can and should be regenerated to pioneer species again
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- Thank you