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FUTURE FOREST MANAGEMENT
IN SOUTHERN SWEDEN

High-Density Birch Shelterwoods:

A Comparative Analysis of Growth, Yield, and Economic Viability in planted Norway Spruce forests

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What is a birch shelterwood?

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Picture: SCA

Traditional reasons for eastblishment of a Birch shelterwood

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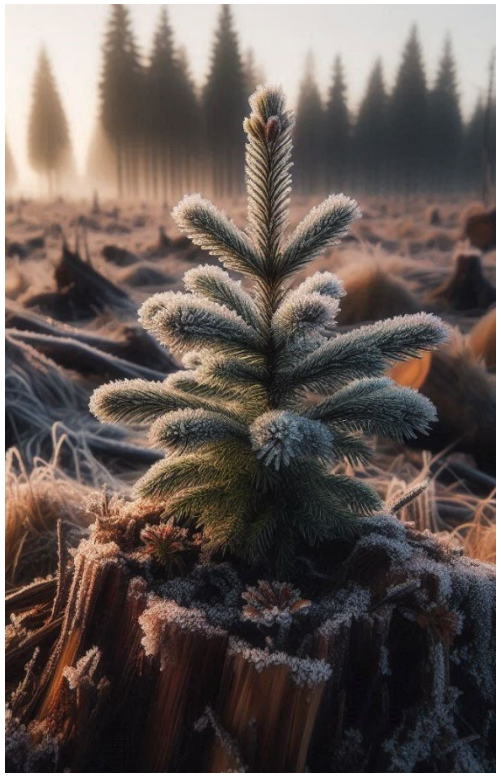
- Reduce the frost damage on planted spruce



- Minimize birch sprouting after PCT

Traditional Management:

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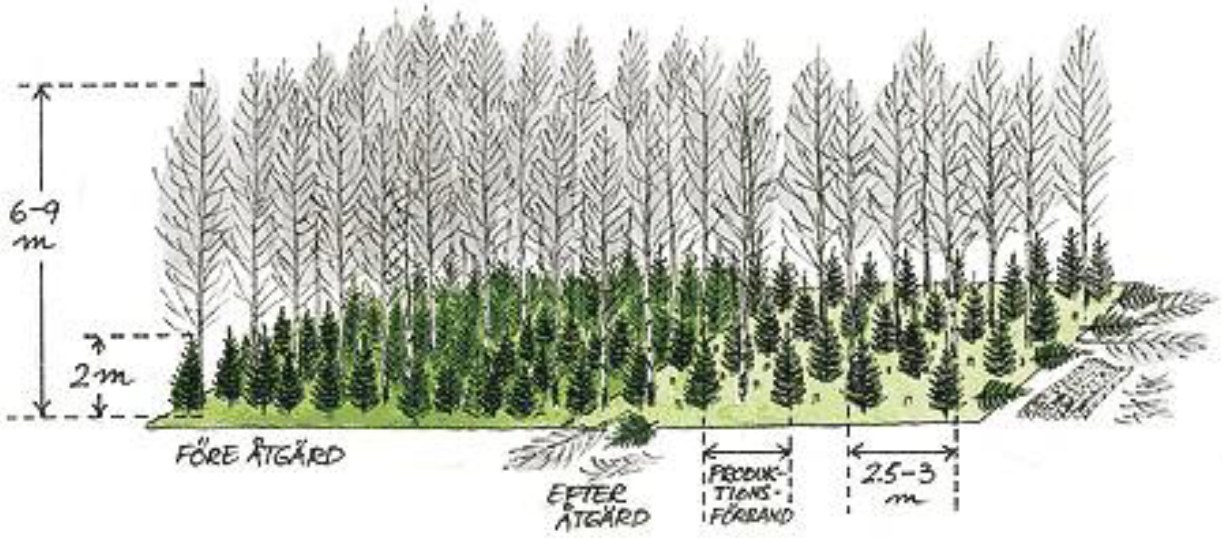
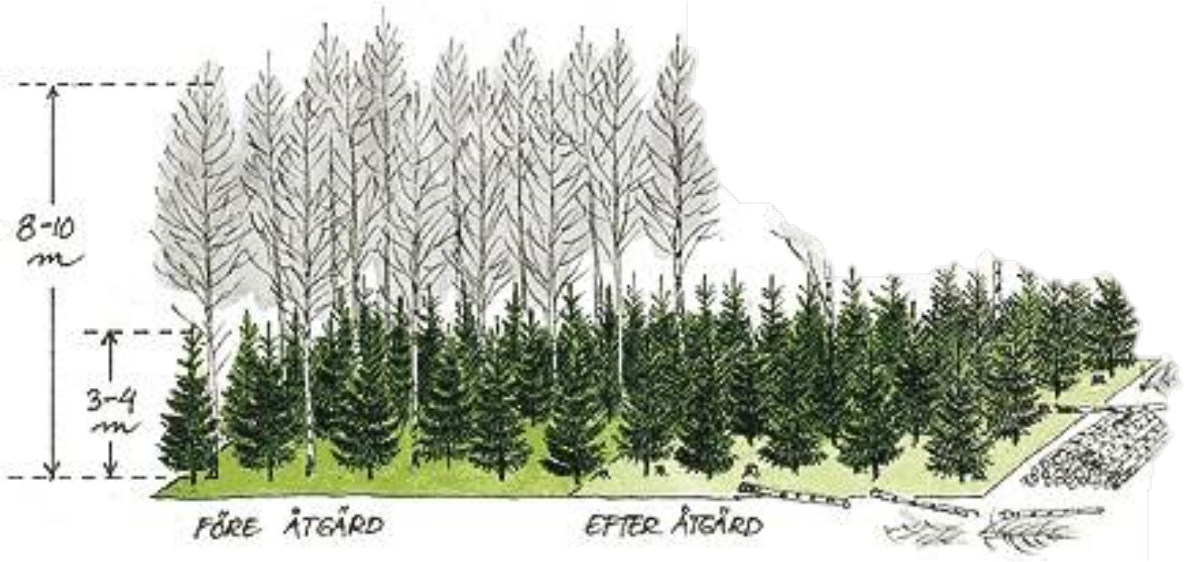
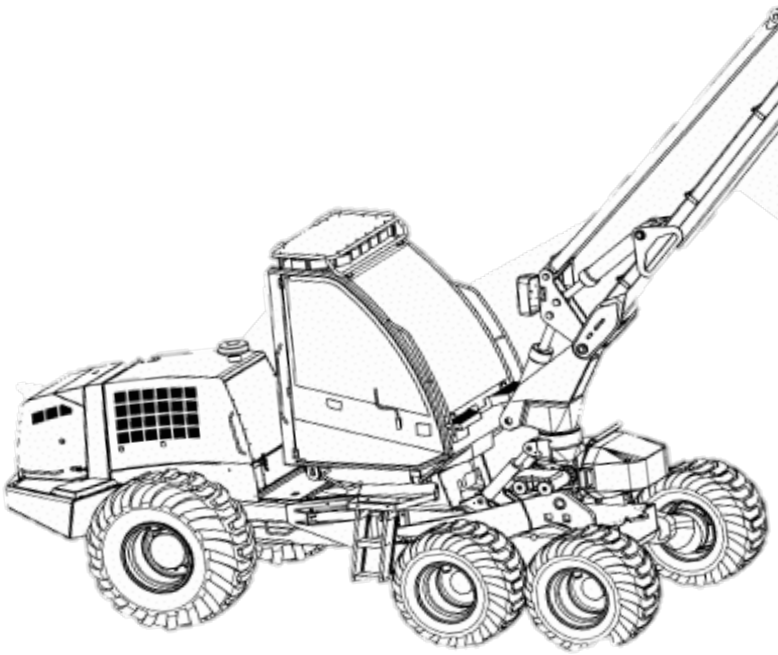
- Remove birch when spruce is safe from frost





High-Density Birch Shelterwoods concept

Focus on a high economic and volumetric yield

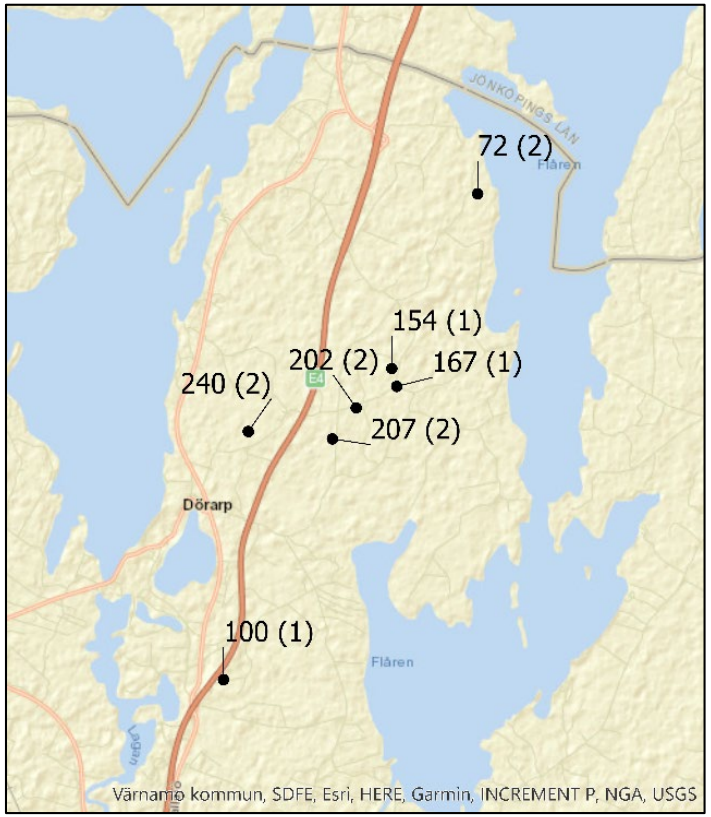


Why is it not used?

- More birch in a stand = bad growth for spruce
- Damage on spruce
- More complicated
- Lower economic yield

Experiment

7 sites
1 control 1 treatment (1-2 blocks)
Fertile (G32)



Experiment

Treatment:
Shelter

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Control

Previous management

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- Planting 2004-2008
- First PCT 2011-2016
- Second PCT 2013-2019 (Treatment only)

Measurement

- Fall 2017 – and every year until fall 2024

Compared to previous research

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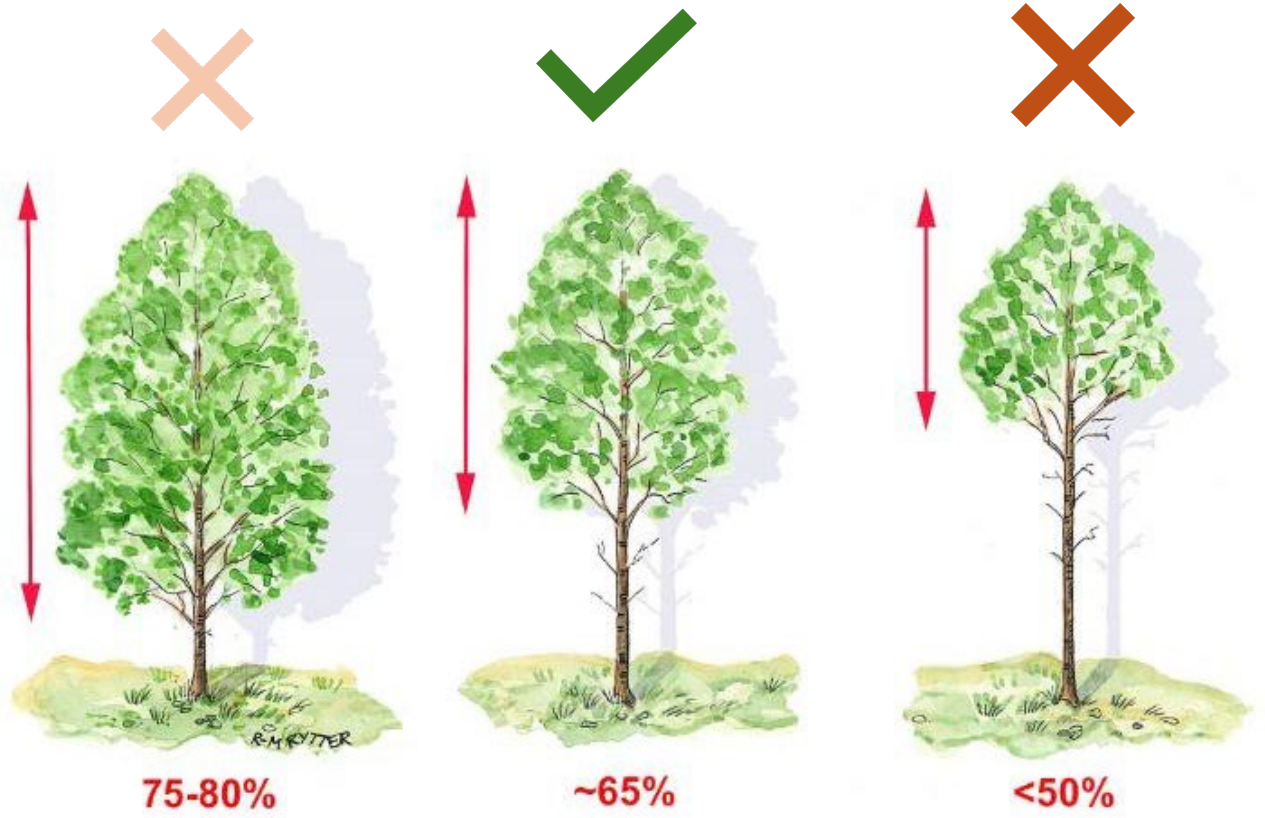
- High resolution data
- Managed by “recommendations” on high SI (two PCT)
- Focus on profits and production for birch = larger birch



What is measured

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EVERY TREE,
EVERY YEAR.

DIAMETER, HEIGHT
AND DAMAGES.

Objectives

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- Production of the trees in the stand
- Economic evaluation of the concept.
- Damages

Main Results

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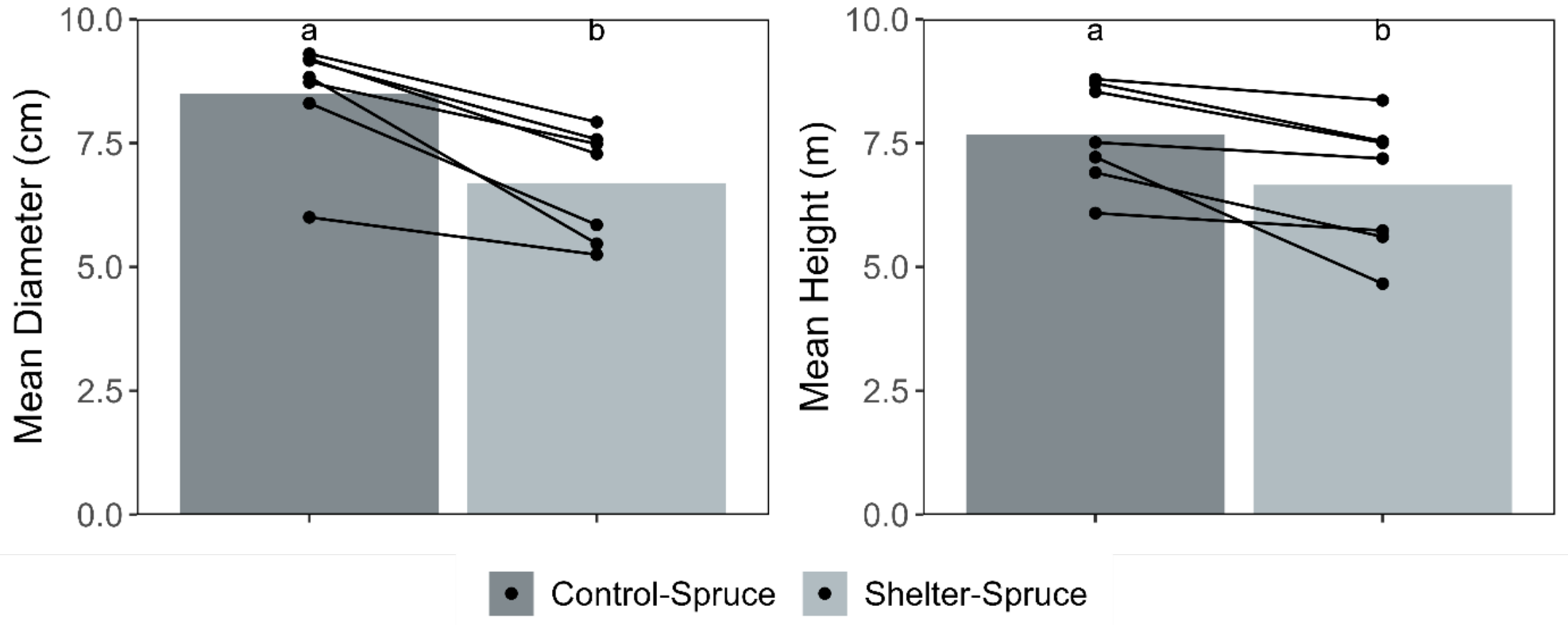

Volume growth

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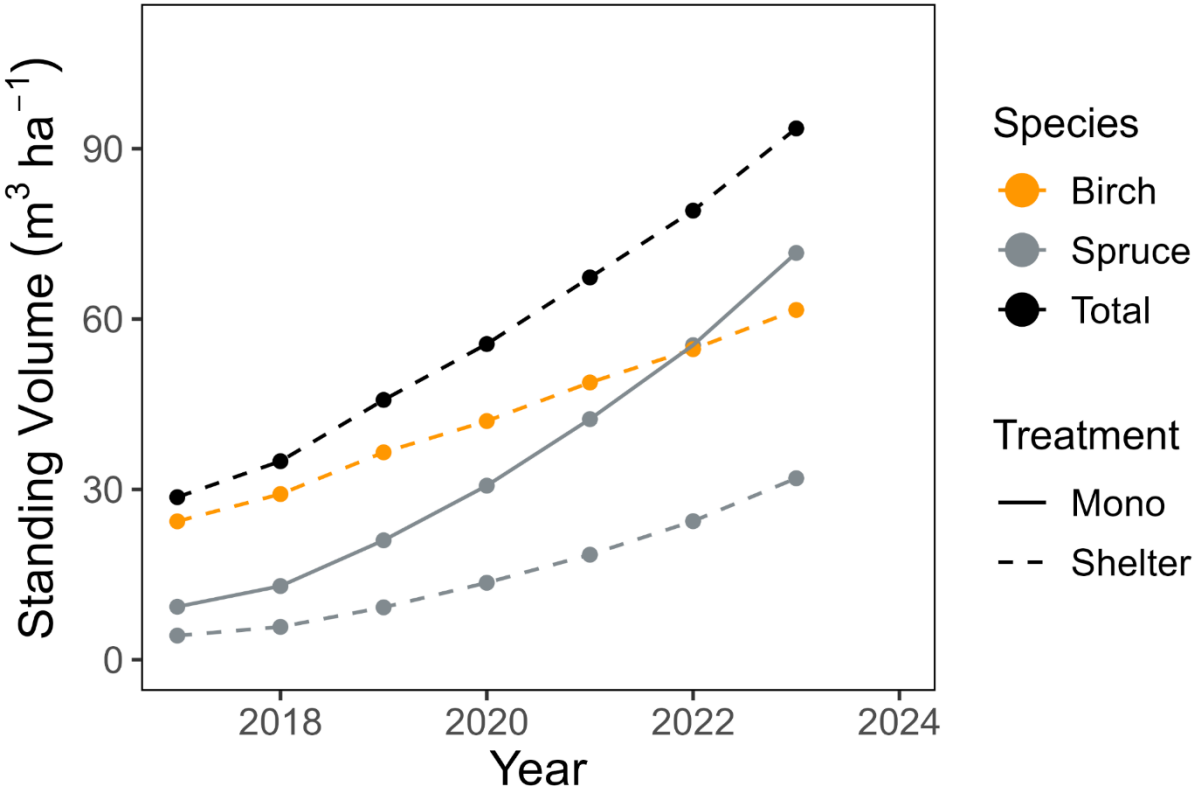
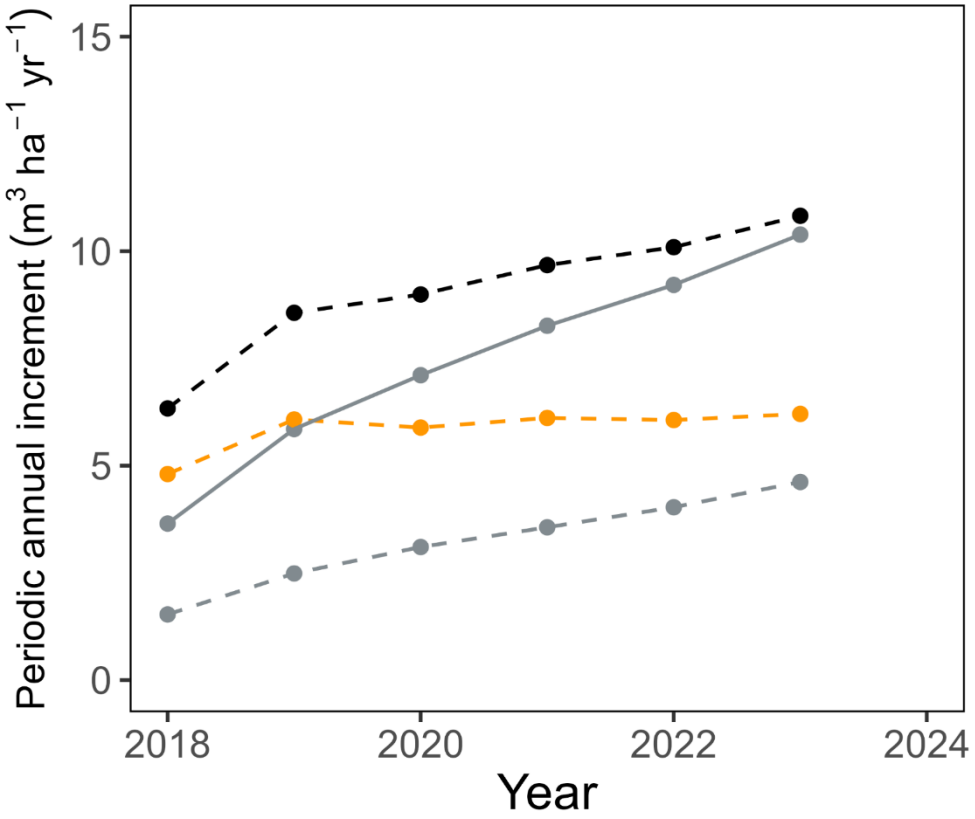
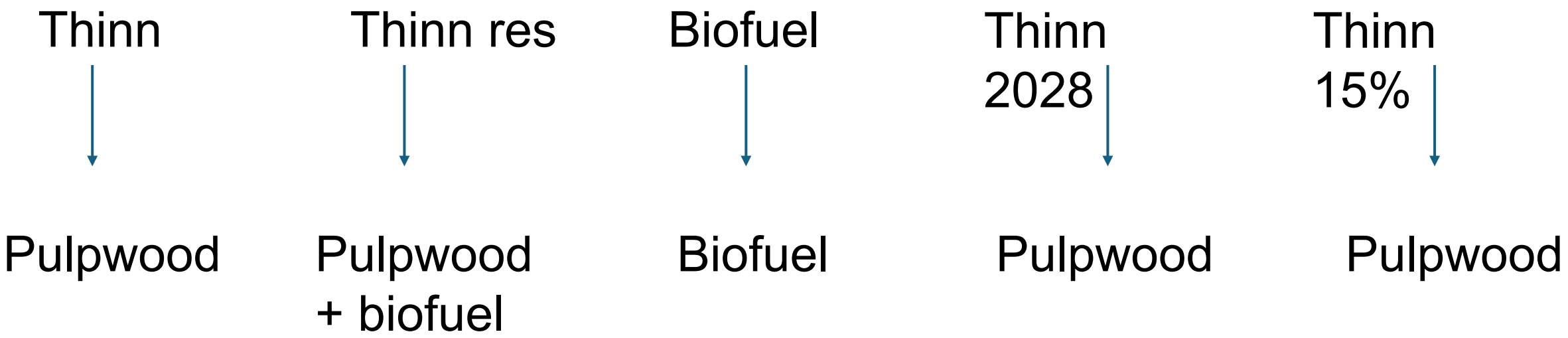
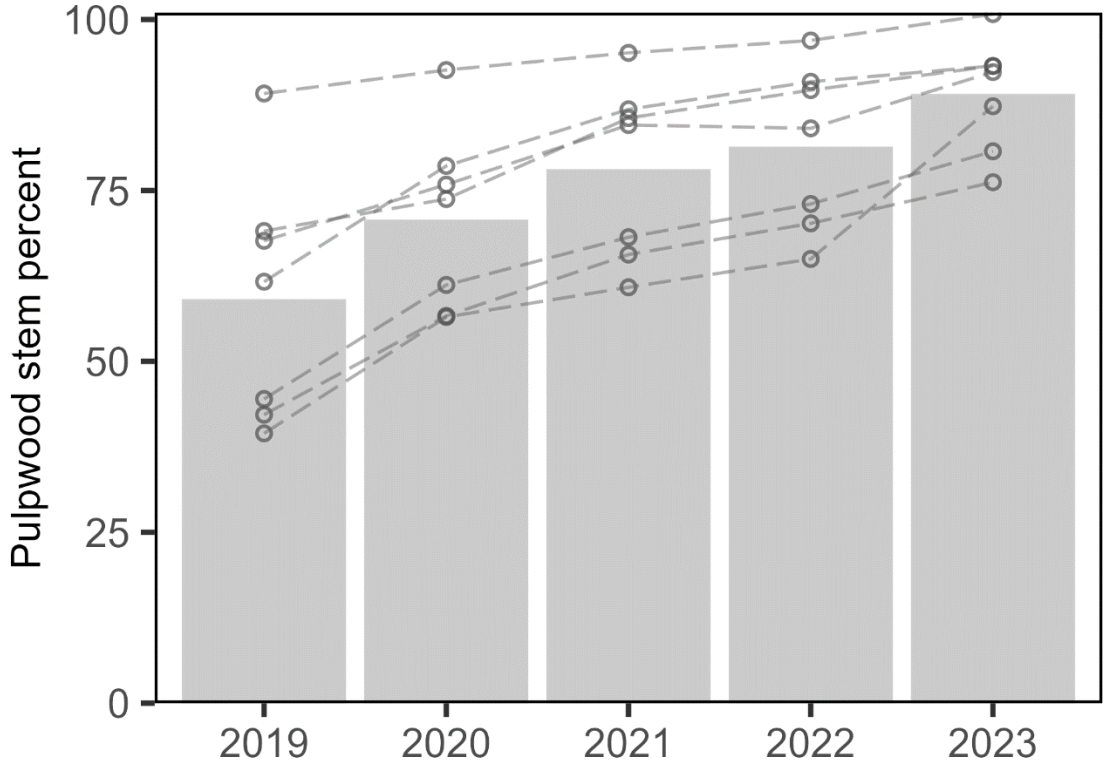


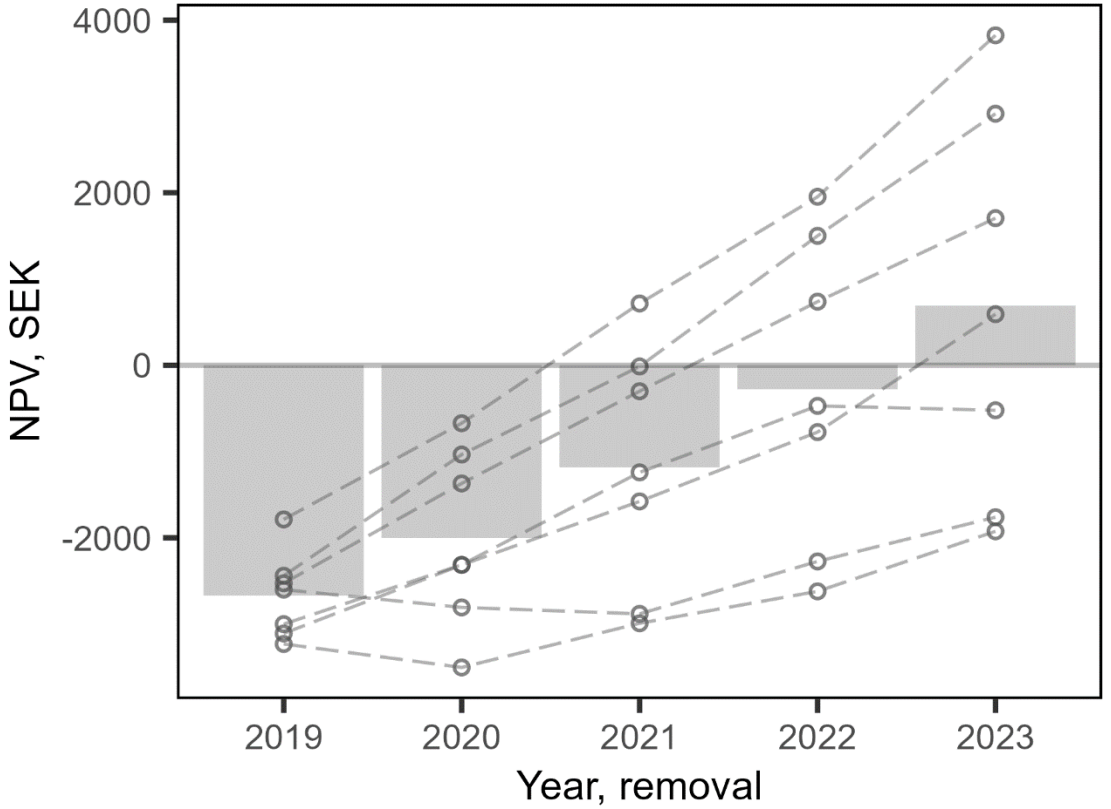


Machine system options



Economic developement of the birch shelter





Economic yield – LEV (land expected value)

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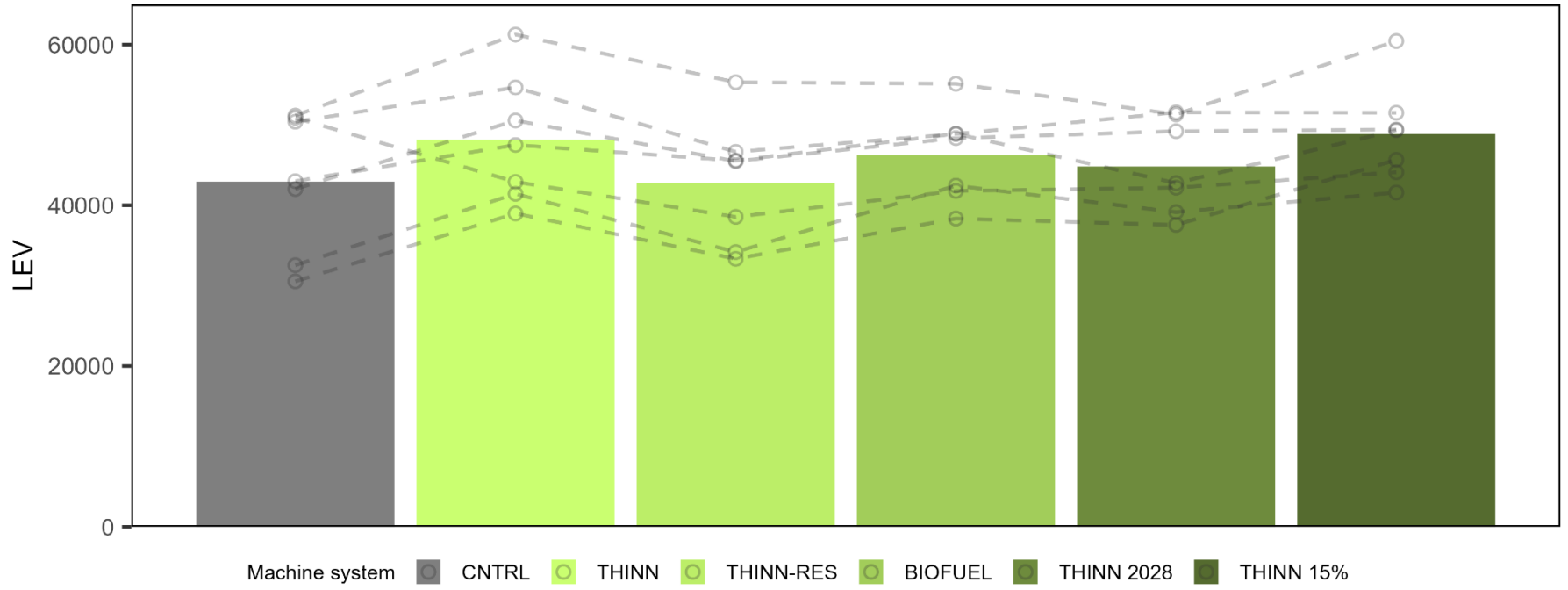
heureka!

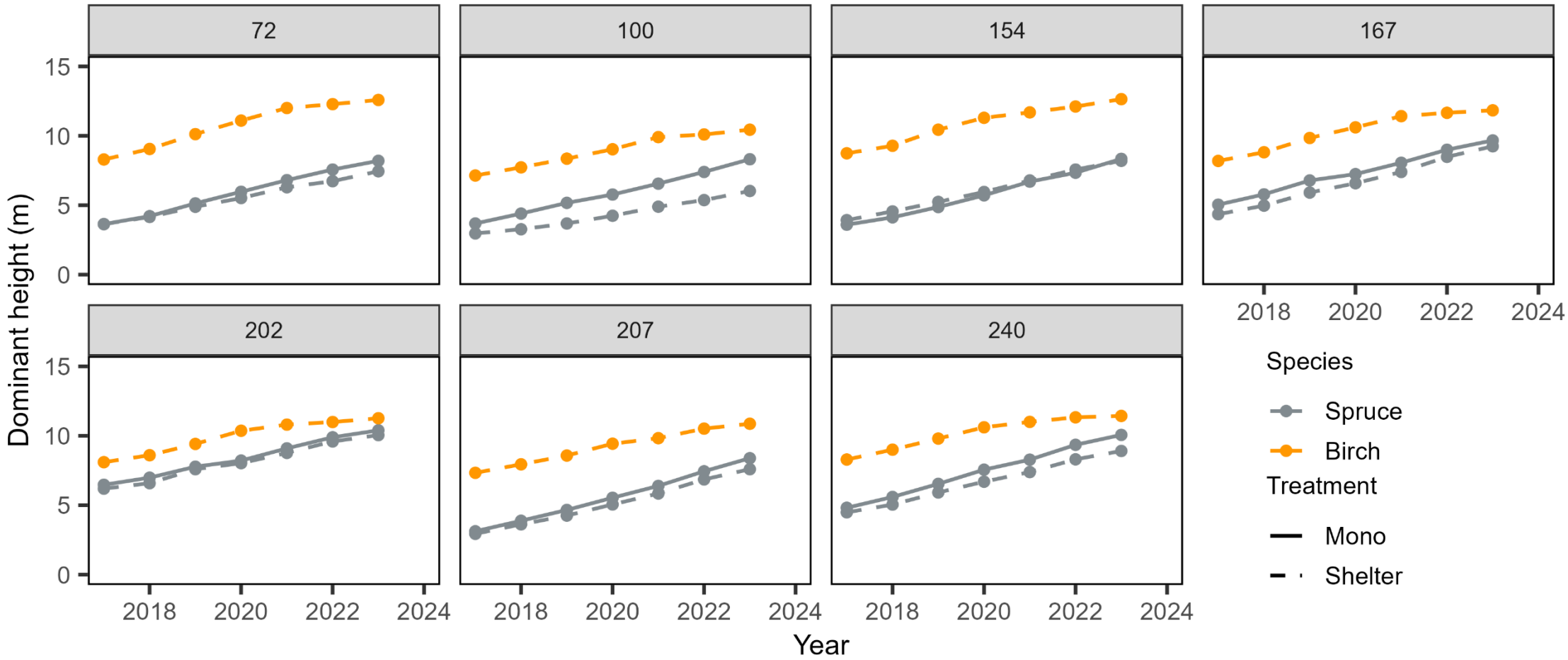


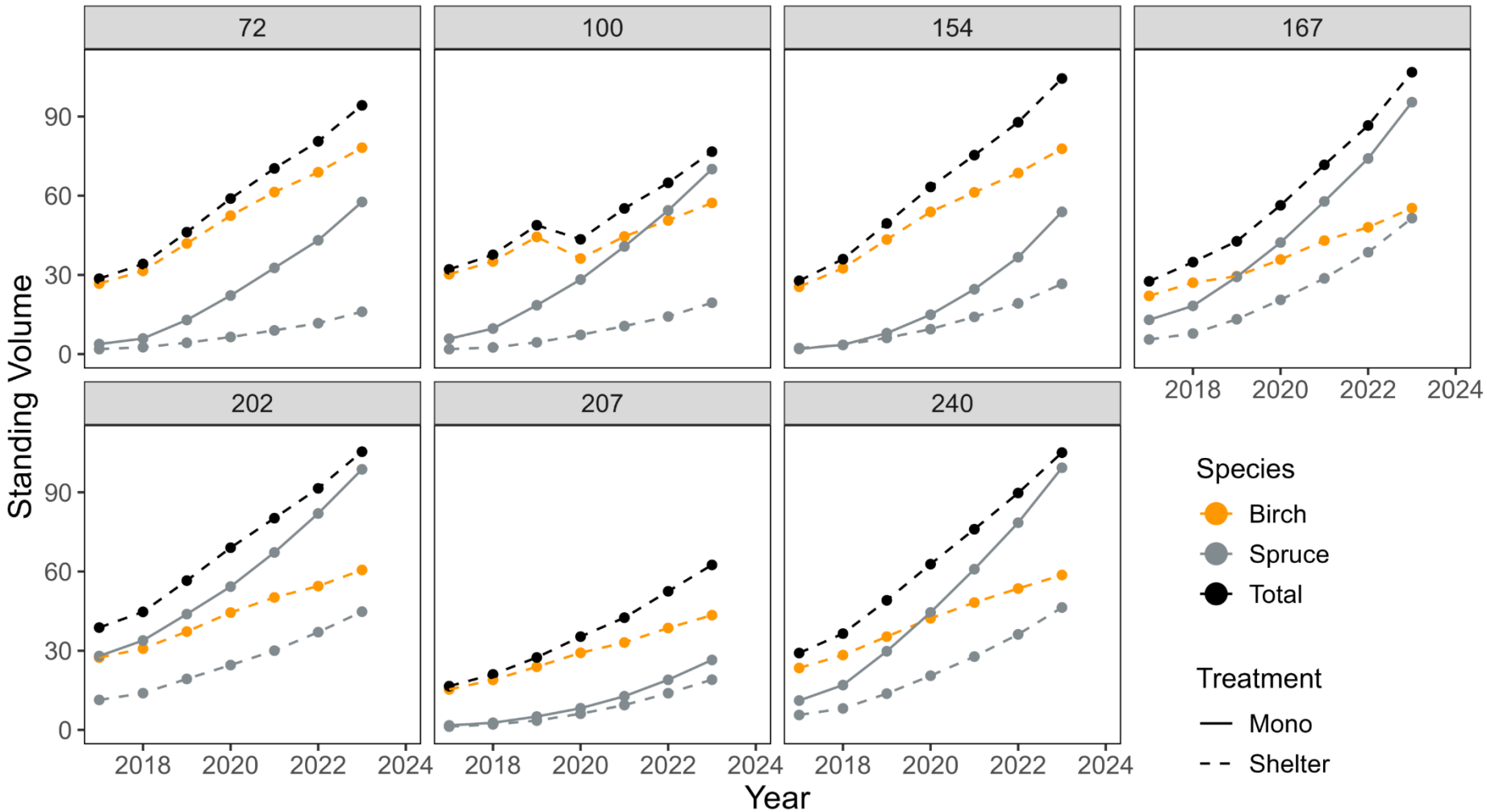
Damages

Questions?

Thanks for listening

Extra slides in case of relevant questions


72
100
154
167
202
207
240
Dominant height (m)
0
5
10
15
2018
2020
2022
2024
Year
Species
Spruce
Birch
Treatment
Mono
Shelter

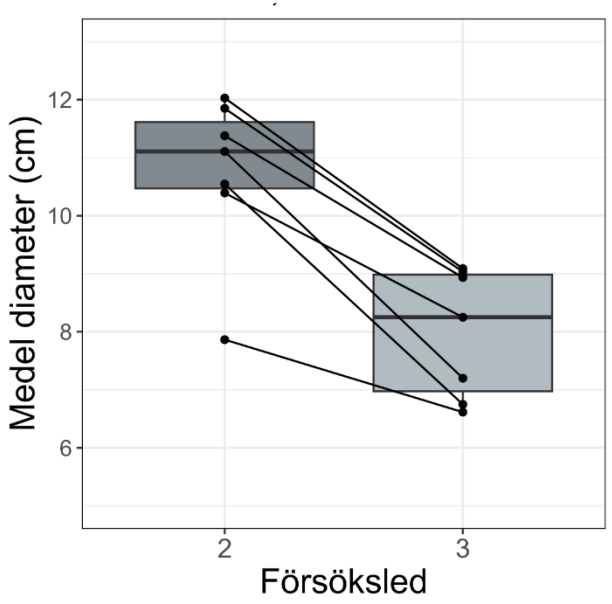

72
100
154
167
202
207
240
Standing Volume
0
30
60
90
2018
2020
2022
2024
Year
Species
Birch
Spruce
Total
Treatment
Mono
Shelter

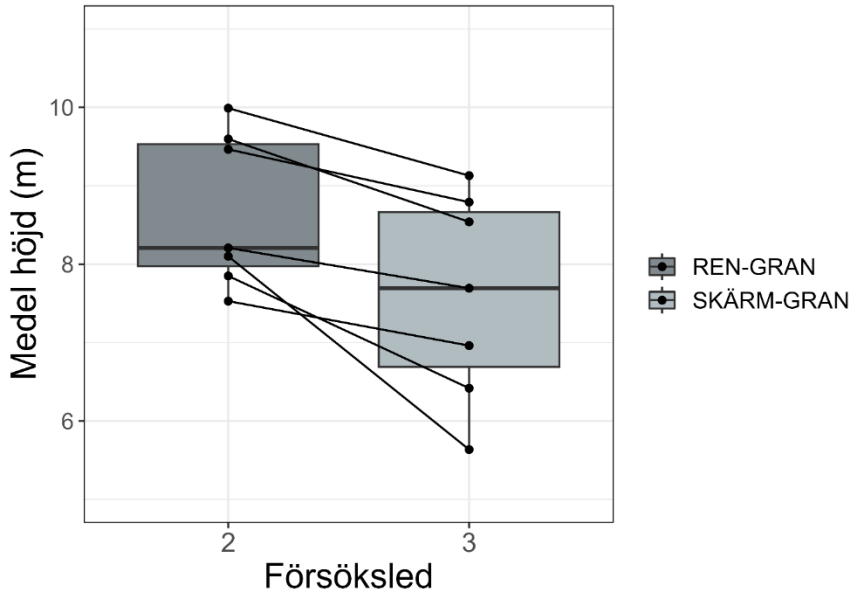
Does spruce diameter/height differ between treatments, in dominant trees?

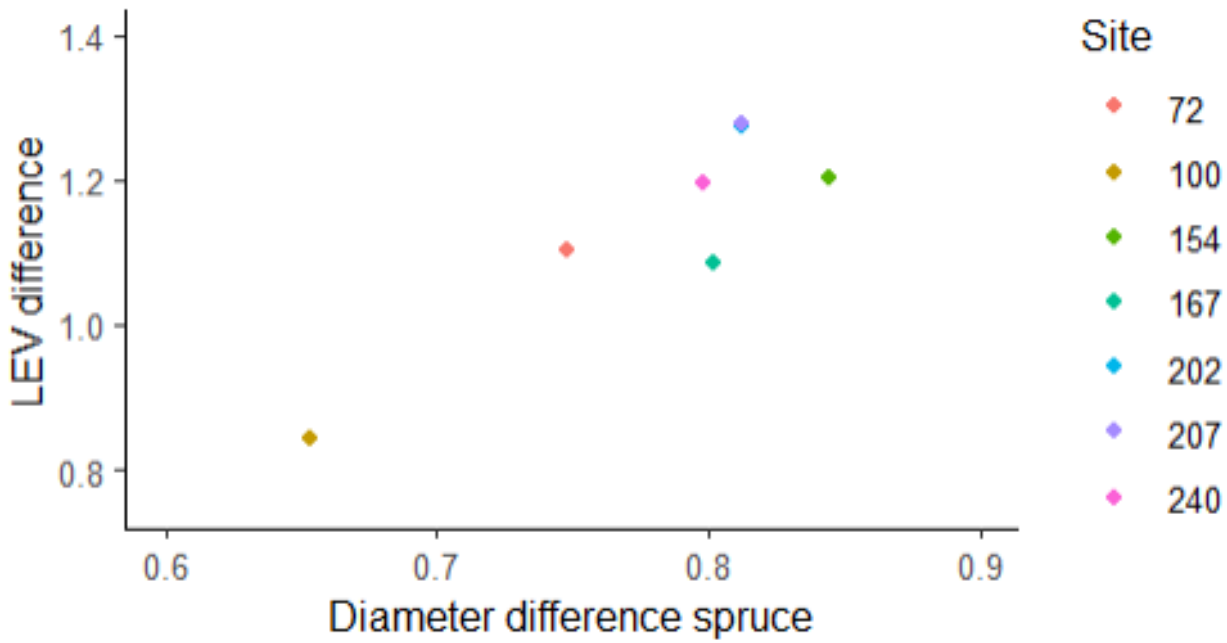
Dominant trees = Biggest 1000 stem/ha

P-value: 0,0002
Mean differnece: 2.7cm

P-value: 0,005
Mean differnece: 1.1m

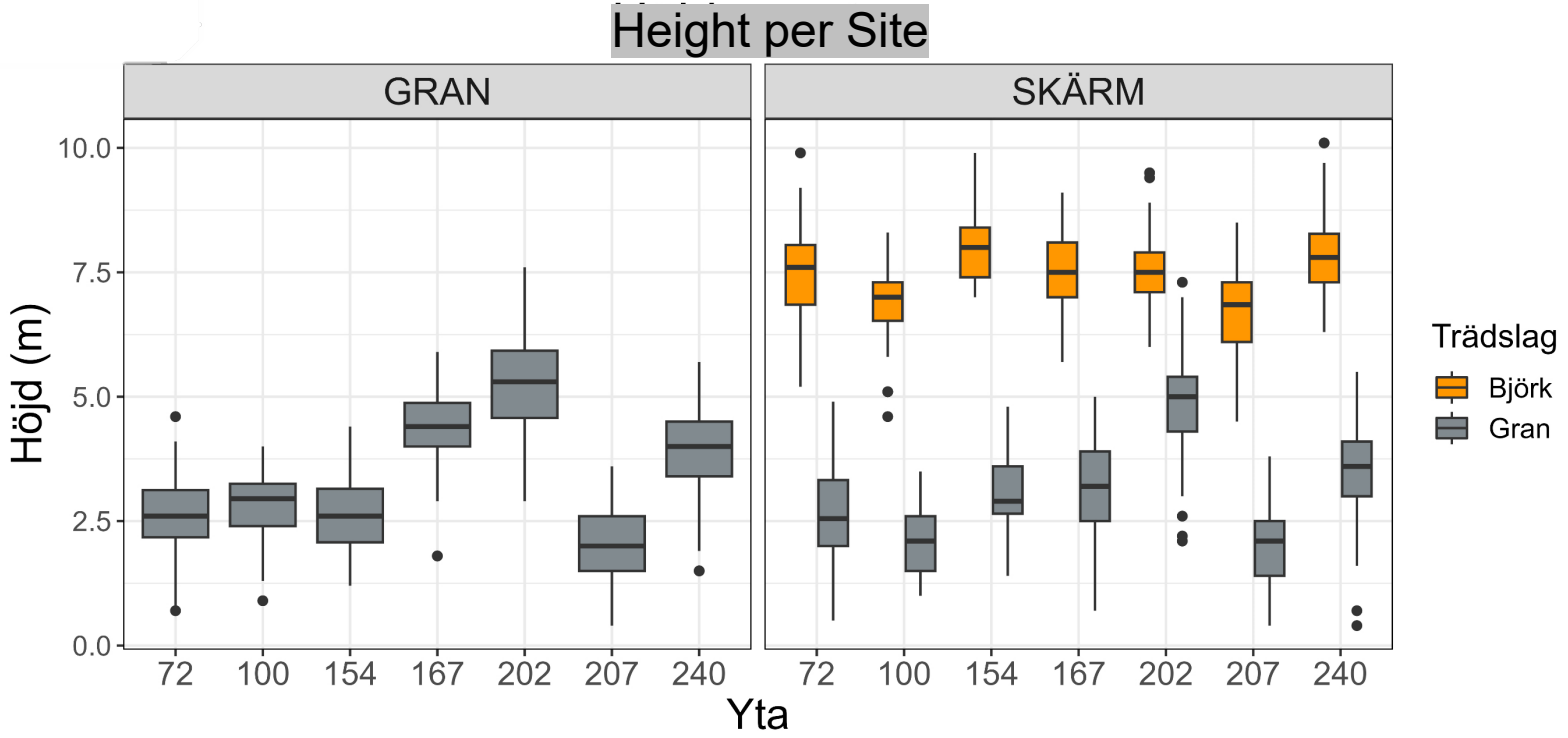





LEV difference
1.4
1.2
1.0
0.8
0.6
0.7
0.8
0.9
Diameter difference spruce
Site
72
100
154
167
202
207
240

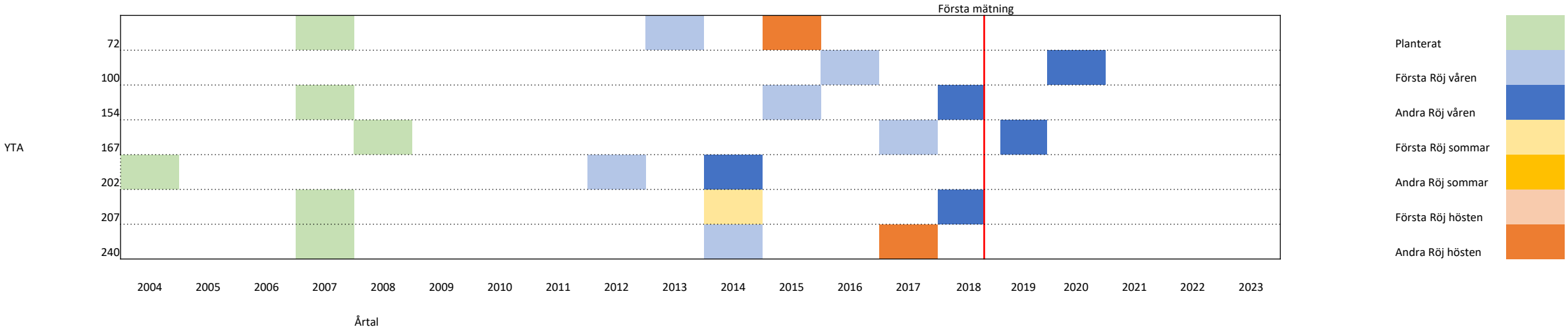
High density birch shelter wood over planted spruce – concept

- Mean height birch 7.5m
- Mean height spruce 3-4m



2017

Planting and PCT



- 22 paired plots in toftaholm

Senaste revisionen

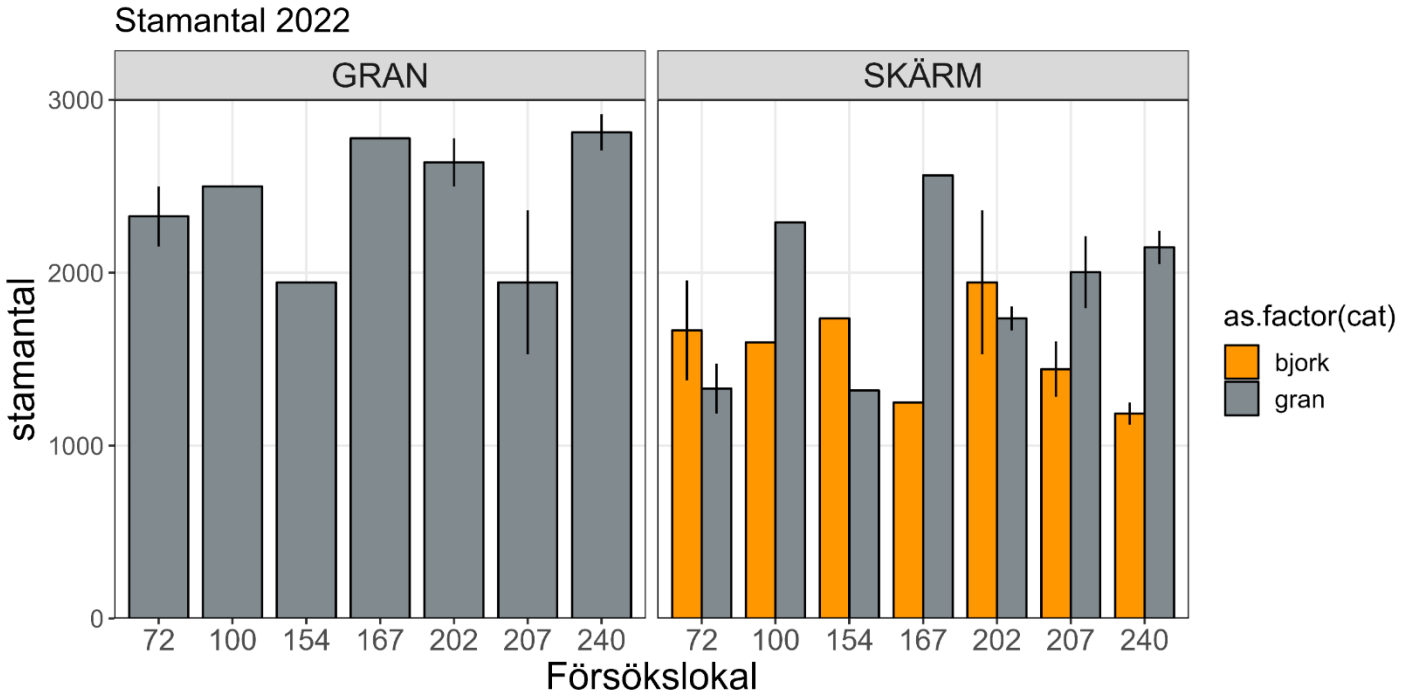
- Rena gran beståndet: 1500-3000 stammar/ha
- Björk skärm 1100 – 2300 stammar/ha
- Granar under skärm 1200 – 2500 stammar/ha

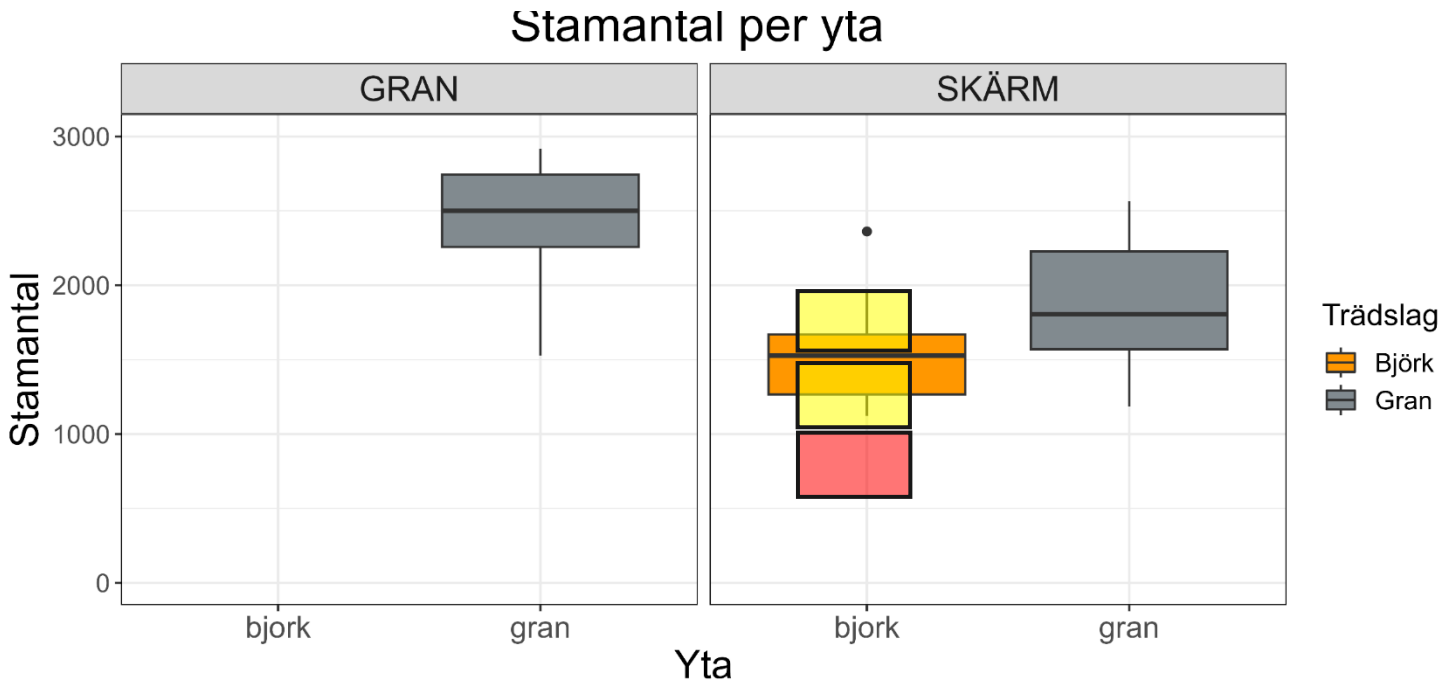
Recommended stems/ha based on the birch height:

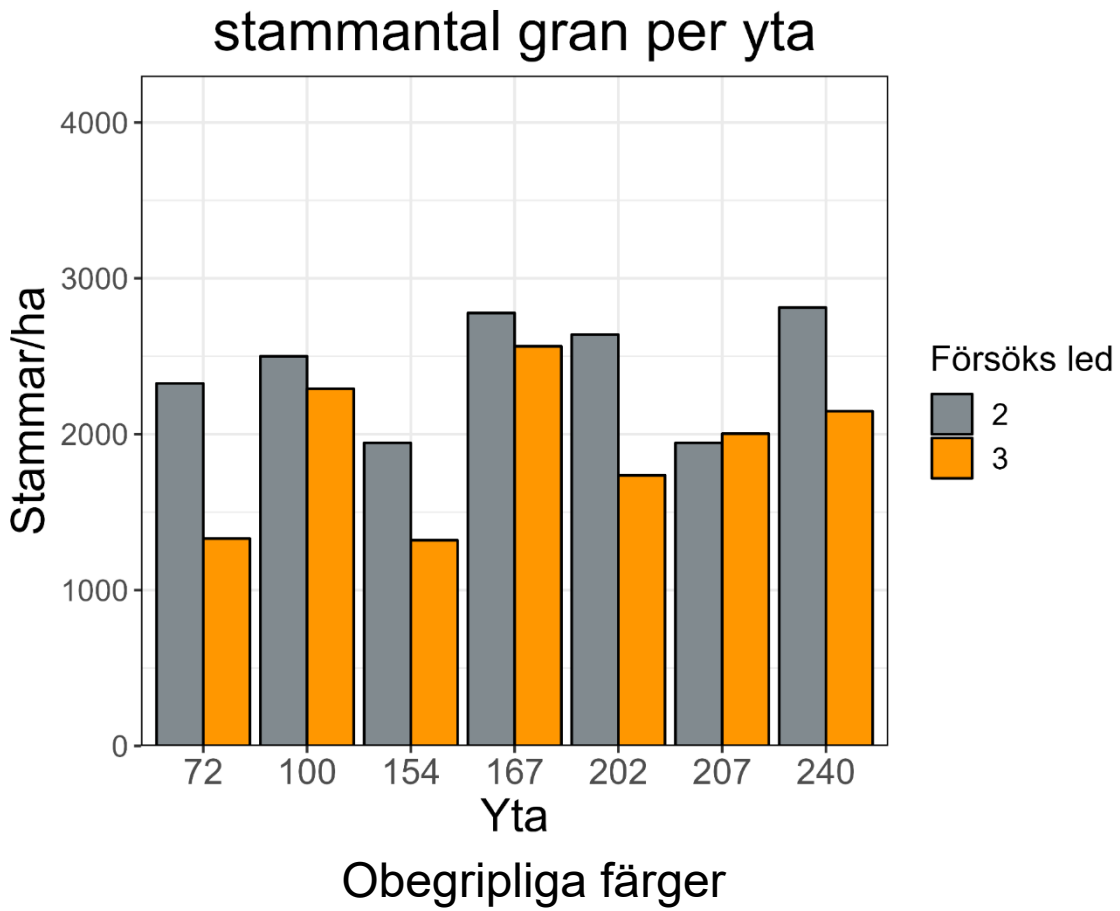
500-1000 in the birch canopy-shelter.

“High density shelter with thinning” (Johansson, T. 2001) 1000-1500

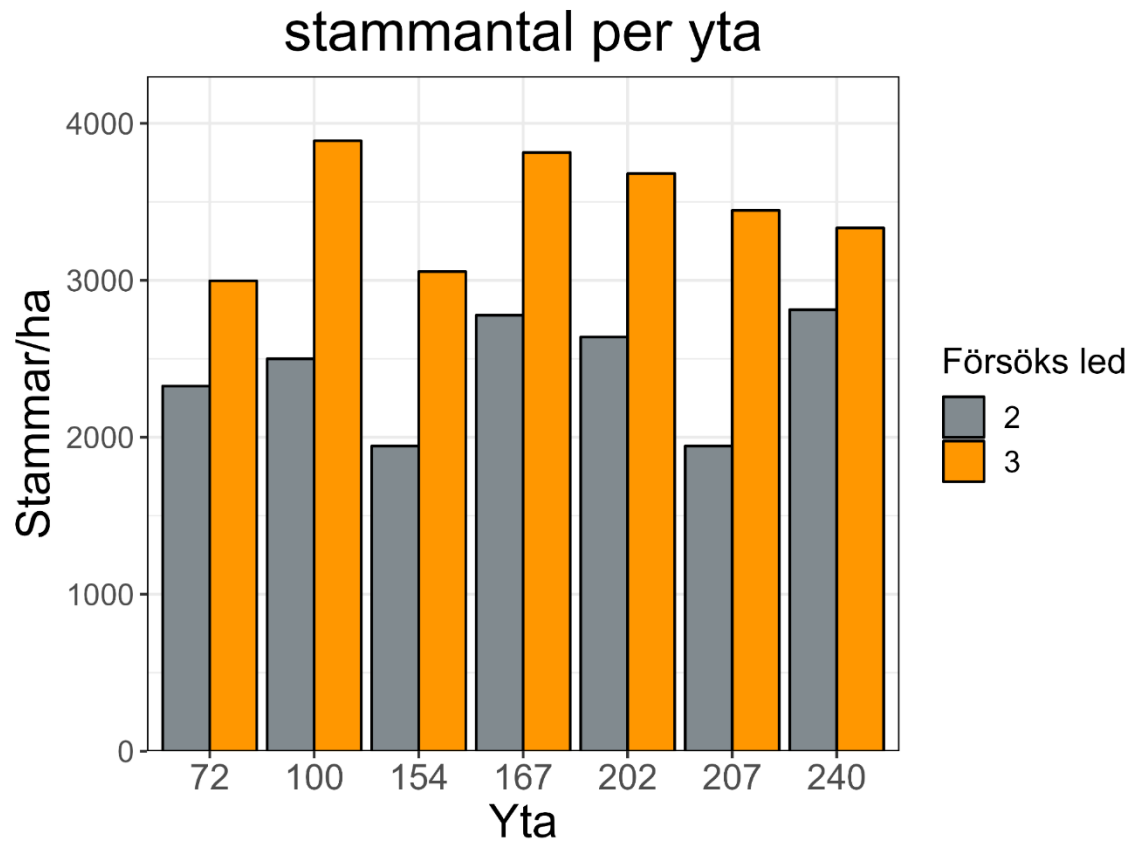
For single story birch stand it should be ca 1500-2000 stem at this height.



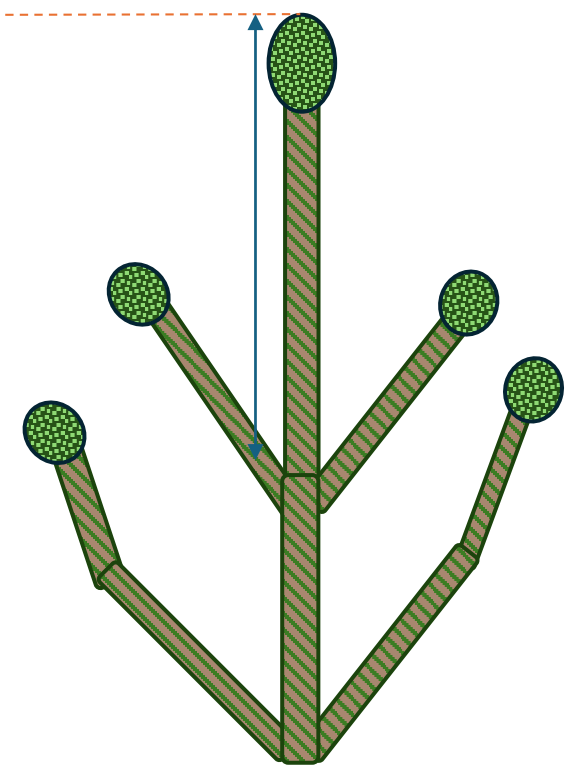




Obegripliga färger



Piskskador



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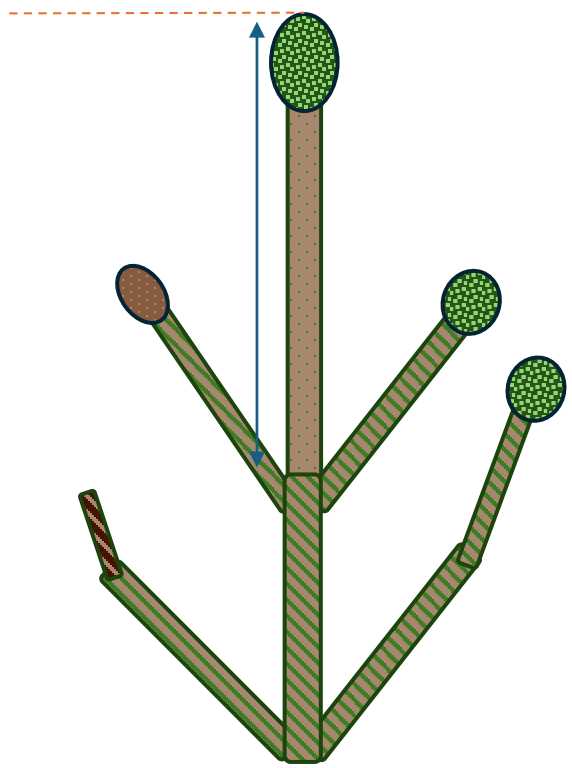

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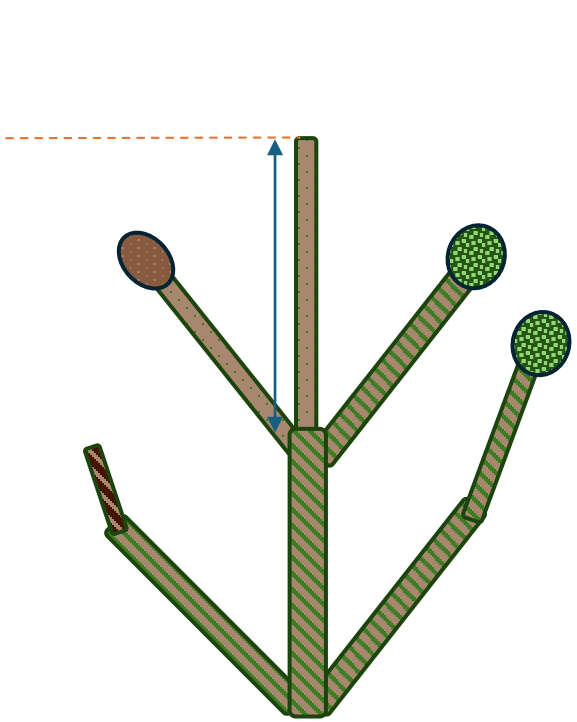

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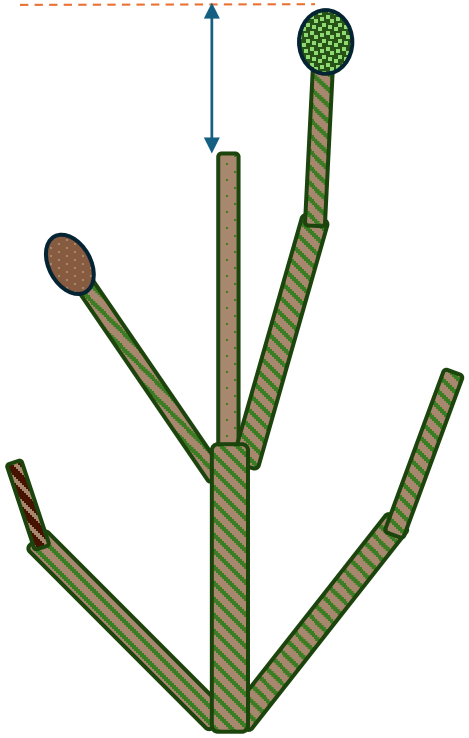

3

Tillväxthöjd i meter