

MSc THESES - 2022

Forest edges	Is there an optimal design for forest edges?
Birch	Birch forest recreation in relation to thinning practice (P) Temporal and spatial variability of birch cambium fly in stems of birch (P + disc scans) Ground flora depending on thinning practice in young stands (2nd inventory)
Beech	Survival, growth and stem quality depending on thinning practice (based on experiments installed in 1998, many treatments) Crown expansion rate depending on age and thinning practice Ground flora depending on thinning practice in young stands (3rd inventory) False heartwood: influence of site and silviculture on the formation and development Thinning review (based on thinning experiments)
Oak	Survival, growth and stem quality depending on thinning practice (based on experiments installed 2002-03, many treatments) Crown expansion rate depending on age and thinning practice Ground flora depending on thinning practice in young stands (3rd inventory) Oak forest recreation preferences: school children (6-15 years; photos available)
Sycamore etc.	Provenances (literature review) – 3 maple species Ripple wood (literature review of the influence of site, provenance, silviculture) Total volume, stem volume and stem taper functions for sycamore (P)
Lime	Lime for wood production: the role of lime in contemporary silviculture
Walnut	Walnut: which species or hybrid is best in Sweden? (3 experiments planted 2020 in Scania, Halland and Södermanland to investigate the influence of walnut type, weed control, irrigation and stumping back on growth, stem form, root development, leader shoot dieback, etc.)
Sorbus aucuparia	Rowan and hackberry for wood production, depending on seed source (P) Growth depression in Sorbus? – compare pure and mixed stands (2-3 experiments) <i>Available: 2-3 seed source experiments in boreal forests + 1 previous MSc thesis</i>
Sorbus torminalis	20 trees at each of 46 sites (inventoried 2012 and 2022): analysis of survival, growth, stem quality, canker, etc. Sorbus torminalis mixed with oak, hornbeam, field maple and hazel (6 blocks, 5 treatments; survival and growth depending on mixing pattern) Sorbus torminalis provenance experiment in England (9 prov., 3 sites): measure and analyse Sorbus torminalis terminal shoot snap-off (P): What is causing terminal shoot snap-off during the growing season? Does the snap-off depend on site or genetic origin (based on experiments)
Sorbus domestica	Sorbus domestica: some young experiments with different seed sources (1 thesis)
Sorbus intermedia	Inventory of Sorbus intermedia in forests in Sweden
Sorbus sp.	Silvicultural practices for Sorbus aucuparia, S. aria and S. intermedia (P)
Wild pear	Stumping back of wild pear (1 experiment, re-measure and analysis) Wild pear in Sweden (P)
Yew	Germination depending on seed pre-treatment/stratification and provenance (P, Alnarp Nursery) Yew in Sweden: describe and analyse selected natural populations of yew Natural regeneration of European yew (literature study and field observations) Establishing European yew by planting (literature study and field observations)

P = proposal elaborated and available; red = recommended

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Student research project

***Sorbus torminalis* terminal shoot snap-off**

What is causing terminal shoot snap-off during the growing season?
Does the snap-off depend on site or genetic origin

Background

Wild service tree (*Sorbus torminalis*) is a native but rare tree species in England. It is fairly drought tolerant, can produce a very valuable timber and contributes substantially to forest and landscape aesthetics. With ongoing climate change it could come to play a larger role in the future.

During the summer of 2022 a snap-off of the terminal shoot of young *Sorbus torminalis* (Figure 1) was observed at different locations in England and beyond. Loss of the terminal shoot is obviously critical for the formation of a single stem and possibly for the survival of the individual.

The origin of the snap-off remains unidentified and it is unknown whether the extent of terminal shoot snap-off relates to local site conditions or to the origin of the *Sorbus torminalis*.



Figure 1 Terminal shoot snap-off in *Sorbus torminalis*

Objective

The objectives of the proposed study are to identify the origin of terminal shoot snap-off in *Sorbus torminalis* (1) and to analyse whether the frequency of snap-off depends on site (growing location) or genetic origin (2).

Data collection

Data should be collected in a provenance experiment planted at three locations across England in the autumn of 2019 (Figure 2). The experiment includes nine provenances of wild service tree replicated four times in a randomized block design (Figure 3) at each location. Each block includes one group of 16 trees of each provenance.

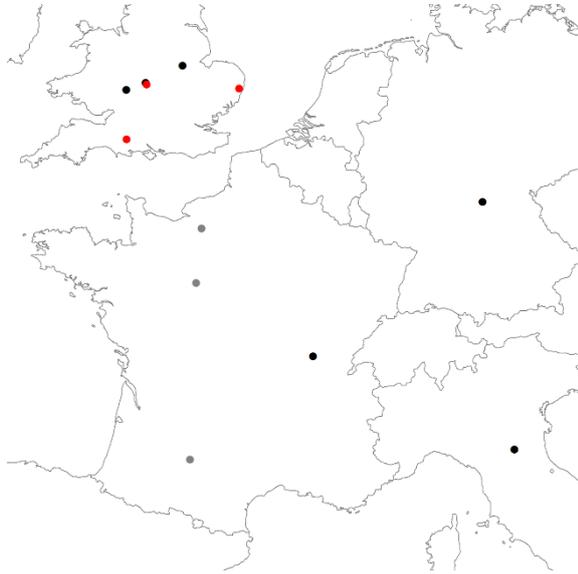


Figure 2 Locations of the experiment (red dots) and the origin of provenances (black dots).

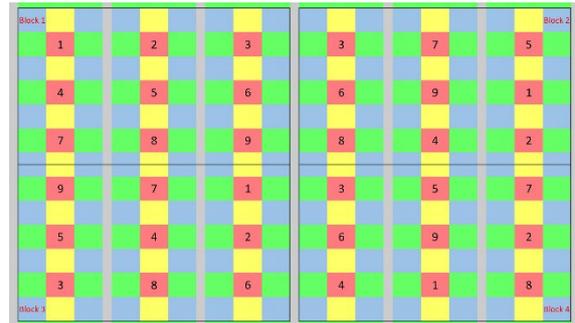


Figure 3 Block lay-out. Legend: red = *Sorbus torminalis*, blue = oak, green = hornbeam, yellow = field maple.

Method

The study should include two components:

1. Identify the origin of the snap-off based on field observations and a literature survey. A preliminary hypothesis is that the snap-off could be caused by the pear shoot sawfly (*Janus compressus*; <https://agrobasesapp.com/france/pest/cephe-du-poirier>).
2. Record and analyse the extent of terminal shoot snap-off. All trees at one or, preferably, all three locations should be observed and recorded for terminal shoot snap-off. In total, there are $9 \times 4 \times 16 = 516$ *Sorbus torminalis* trees per location. Depending on the nature of the data collected, the analysis can be conducted as an analysis of variance using provenance and site as potential explanatory variables. Tree size (total tree height) is not believed to influence the occurrence or severity of terminal shoot snap-off but may be considered as a potential co-variate.

Reporting

The study should be reported within the normal format and frames for university student assignments.

Supervision

The study will be supervised by your local supervisor/teacher. Further guidance and supervision will be provided by Forest manager Christopher Guest (christopher@cjgsilviculture.co.uk) of *CJG Silviculture* and Professor of Silviculture Jens Peter Skovsgaard (jps@slu.se) of the *Swedish University of Agricultural Sciences*.

Wild pear in Sweden

Background

Wild pear is a threatened tree species that does not completely match classical high forest of shade-tolerant trees. It is a highly praised, but rarely occurring element in forests and landscapes. At the same time wild pear is among the highest paid timbers in Europe. Wild is drought tolerant and well-suited for the expected future climate of southern Sweden. For these reasons there is an increasing interest in growing and producing wild pear.

Objective

Throughout southern Sweden there are a number of wild pear trees, but no inventory data exists and no information is available about the circumstances for its occurrence or how to preserve or promote wild pear.

The objective of this project is

- to compile an overview of the occurrence of wild pear (*Pyrus pyraster*) in Sweden,
- to analyse site conditions and forest types in which it prevails, and
- to analyse the dimensions of wild pear trees in relation to neighbouring trees.

The results should be discussed in the contexts of silviculture and gene conservation.

Thesis work

The student should locate and measure wild pear trees in Sweden. Next, the student should visit and interview foresters and others who can contribute information on their origin and the circumstances for their occurrence. – Based on this the student should compile and contrast all relevant information and provide guidelines for suitable site-specific silvicultural and gene conservation guidelines for wild pear.

Supervisor

Jens Peter Skovsgaard, Southern Swedish Forest Research Centre, SLU-Alnarp, e-mail: jps@slu.se

Total volume, stem volume and stem taper functions for sycamore (*Acer pseudoplatanus*)

Accurate volume and taper functions have been developed for several major tree species. Sycamore is a minor species in terms of area coverage, but it is a highly significant component of temperate forests in Europe and a significant contributor in the forest economy. The few functions available for sycamore are generally of poor quality and often inconsistent in their construction or formulation.

The objective of this project is to develop total volume and compatible stem volume and stem taper functions for sycamore based on a dataset from Denmark. The data comprise observations of more numerous trees in six statistically-designed experiments and some few, other forest stands. Additional trees can be sampled for this investigation.

The thesis is expected to include a brief literature review of volume and taper functions, the development and estimation of volume and stem taper functions and a discussion of the results in relation to similar functions for other tree species. The functions for stem volume and stem taper should be compatible, i.e. the volume integral of the stem taper at any point along the stem should equal the stem volume from ground level to this point.

This type of functions, with similar restrictions, was previously developed for, for example, oak. The enclosed pdf explains the work procedure and the result for oak.

The student for this project should take an interest in math, data handling and statistics (simple regression analysis).

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Silvicultural practices for European rowan (*Sorbus aucuparia*) common whitebeam (*Sorbus aria*) and Swedish whitebeam (*Sorbus intermedia*)

Objective

The objective of this project is to do a comprehensive review of silvicultural practices for European rowan, common and Swedish whitebeam.

Background

Rowan and whitebeams occur throughout temperate and boreal regions of Europe and Asia. They are often a significant component in the landscape, but are generally considered inferior tree species in forestry. Nevertheless, the timber may fetch high market prices for furniture, tools and other special uses, the berries are used in food and beverage production, and the trees substantially help enhance biodiversity and landscape aesthetics.

Only few foresters have specific and comprehensive knowledge or experience of suitable silvicultural practices for rowan and whitebeams and there are only few field experiments with either of these. However, in Norway there is a thinning experiment with rowan that was established in the 1930s, in Great Britain and Sweden there are valuable genetic trials, and there are probably also interesting experiments in other countries.

Thesis work

The student should review the literature on *Sorbus* silviculture. Next, the student should visit and interview foresters who can contribute information on the silviculture of rowan and whitebeams. The student should also visit selected experiments in northern Europe. Depending on the status of the experiments the student may analyse relevant data and possibly re-measure selected plots to update the knowledge level. – Based on this the student should compile and contrast all relevant information and provide guidelines for suitable site-specific silvicultural guidelines for the European rowan, common whitebeam and Swedish whitebeam.

Supervisor

Jens Peter Skovsgaard, Southern Swedish Forest Research Centre, SLU-Alnarp, e-mail: jps@slu.se

Temporal and spatial variability of birch cambium fly in stems of birch in southern Sweden

The objective of the project is to investigate and possibly model the occurrence of stem discolouration due to larval tunnels of birch cambium fly (*Phytobia betulae*) in even-aged stands of birch in southern Sweden in terms of temporal and spatial variability within the stand as well as within the stem.

Birch cambium fly is essentially harmless to the health and stability of birch, but larval tunnels in the xylem reduces the quality of birch timber. The female birch cambium fly lays eggs in the top of the tree and a larva bores its way down in the cambium layer towards the base of the tree. As the tree fills the larval tunnels with parenchyma cells and resin, the tunnels appear as brown streaks in the wood. On stem cross sections the tunnels appear as so-called pith flecks. This usually degrades the aesthetic quality of veneer and furniture wood and may result in substantial price reductions.

The resistance mechanisms of birch and, to some extent, the biology of the birch cambium fly remain unknown. There appears to be large variation in the occurrence of birch cambium fly depending on climatic factors, birch genetics (clonal variation), site conditions and the growth of individual trees.

The thesis is expected to include a literature review of the problem and an investigation of the temporal and spatial occurrence of stem discolouration in stands of silver birch (*Betula pendula*) selected specifically for the production of high-quality timber in southern Sweden.

In one young stand of so-called T3 origin 92 trees have already been sampled for 7 stem discs each at 1 metre intervals from the stem base. These should be scanned and analysed for the number, size and location of pith flecks. Additional material should be sampled in stands on other sites and age classes. Based on this, factors determining the extent of discolouration should be identified and, if relevant, modelled on temporal and spatial scales in relation to climate, site, stand and tree variables.

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25 Feb. 2011

Proposal for MSc thesis

Recreation in birch forests in relation to thinning practice

Birch is a significant component of forests in Fenno-Scandia and throughout the boreal zone, but little is known about the relationships between management practice and the recreational value of birch forests. Young stands are generally dense, and precommercial thinnings are carried out to promote the long-term economic potential of the stand. Often, other management objectives, such as forest recreation or biodiversity, are given little consideration during thinning operations.

Recently, two statistically designed field experiments were installed in young stands of birch to investigate the effects of alternative thinning practices on a range of tree and stand characteristics. The range of thinning practices is illustrated in the figure below.

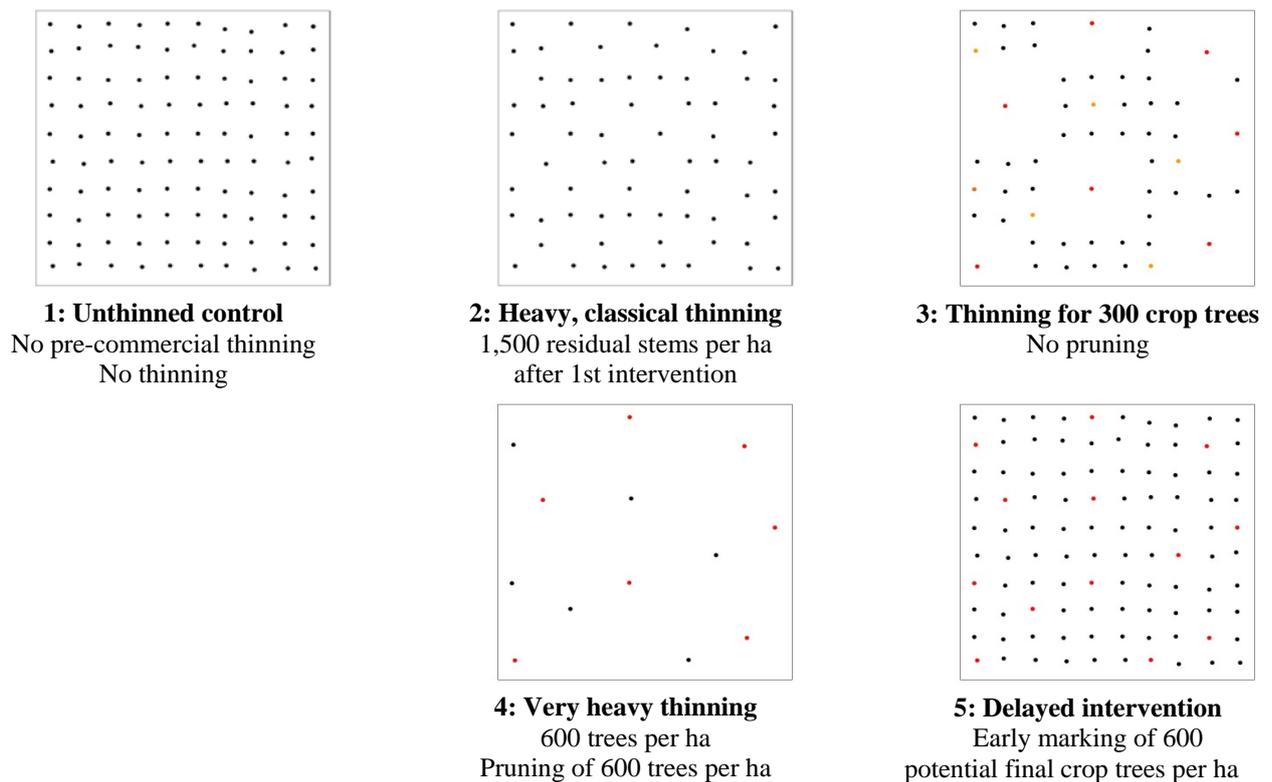


Figure: Main treatment regimes in experiments on thinning and pruning of young birch in Sweden. Red dots indicate trees for pruning (treatment 4) or potential future crop trees (treatments 3 and 5). Yellow dots indicate reserve potential future crop trees which may be used to substitute those developing less desirably during the production process.

It is suggested that these experiments could be used for an investigation of the recreational value depending on thinning (and pruning) practice, or rather, the recreational preferences of visitors depending on thinning (and pruning) practice. Part of the questionnaire survey should focus on the visitors' willingness to pay for the visit.

The investigation should be based on photographs of each treatment type. The photographs should be circulated among students, foresters and general public members together with a questionnaire about their preferences (see, for example, article published 2009 in Scandinavian Journal of Forest Research, vol. 24, pp. 28-36).

The survey should be conducted by the student with help from the supervisor, data should be analysed and results presented in the thesis. Due to the increasing importance of birch in the context of urban forests, knowledge of such preferences could have strong implications for future management practices for birch.

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Co-supervisor: Professor Mattias Boman

25 May 2012

Silvicultural practices for European silver fir (*Abies alba*)

The objective of this project is to do a comprehensive review of silvicultural practices for European silver fir across its natural and introduced range in Europe.

Silver fir is one of the most important tree species in many temperate forest types. A range of silvicultural practices has developed and is being used, depending mainly on local traditions, local market conditions and owner-specific management objectives (including timber production, decoration greenery and erosion control). Much of this remains essentially un-documented or has been published in languages that are not well understood across the relevant geographical range. This also holds for silvicultural experiments, many of which have been published only in grey-literature reports and local forestry journals."

The thesis should summarize, contrast and evaluate the silvicultural practices for silver fir, making the collective body of knowledge accessible to a wider range of English-speaking audience.

The prospective student is expected to speak or read one or more Central European languages (including German, Polish, Czech, Italian, French, etc.) as well as English.

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