PhD project

Regeneration and management of birch for broadleave- dominated forests

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Bergvik Skog

- 1 850 000 hectares of productive forest land in (mid-)Sweden, 8,4% of all Swedish forests
- Mean standing volume 127 m^3/ha
  - 54% Scots pine
  - 36% Norway spruce
  - 2% Lodgepole pine
  - 8% Deciduous
- Annual felling ~6 000 000 m^3ub
  - non-declining

+80 000 hectares of productive forest land in Latvia, more deciduous volume

5% of all (stands) area on mesic and moist sites must be dominated by deciduous species

- 2,0% of all mesic and moist stands are dominated by deciduous species
- Another ~2,0% may be created by selective thinning of stands with deciduous elements, or delineation of parts of stands with high deciduous proportion
  - Remote sensing using satelitte imagery to detect deciduous patches is used in practice for this purpose
- The last ~1,0% must be created ”from scratch”, with natural regeneration of birch

- How can we select the best sites for, and regenerate the ~1 % in the best way?
- How can we manage all 5 % in the best way throughout the rotation period?
- How can we regenerate all 5 % in the best way for the second and subsequent generations?

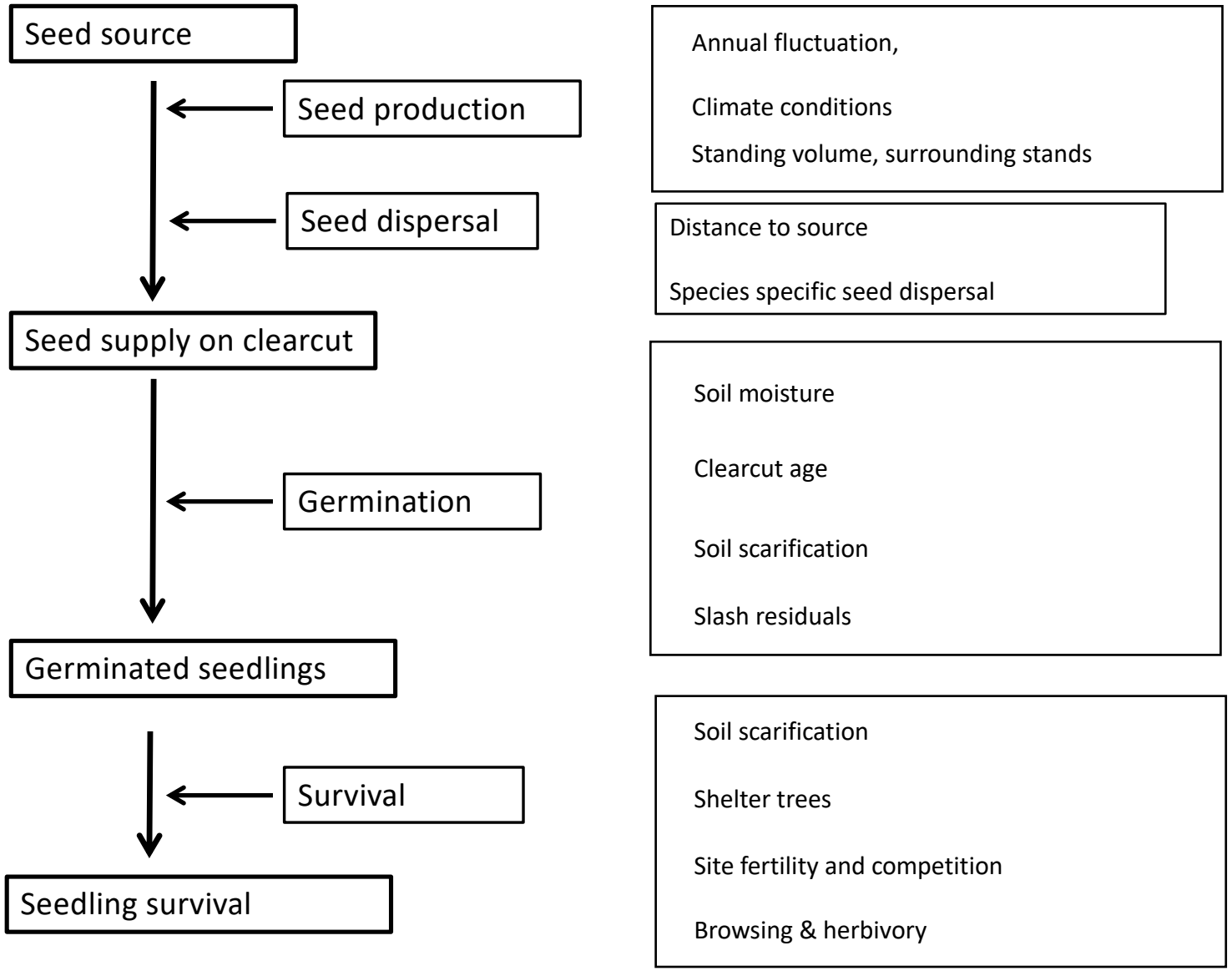
Seed source

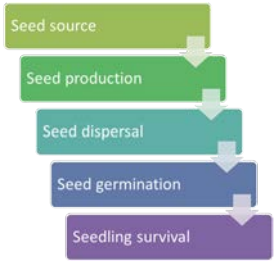
Seed production

Seed dispersal

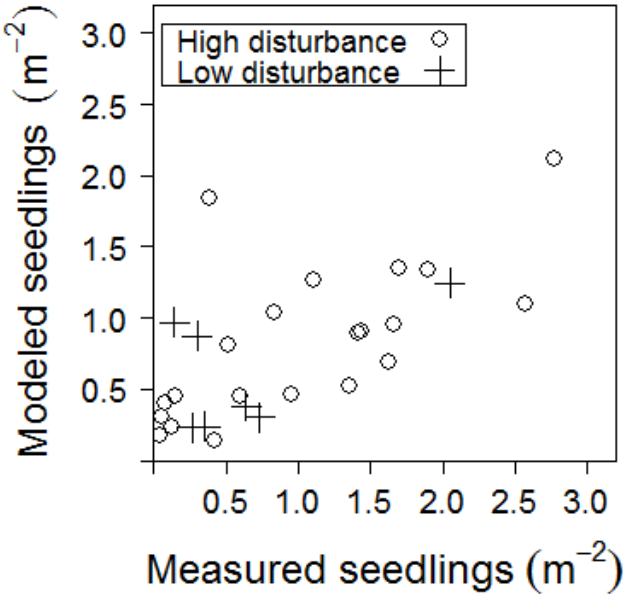
Seed germination

Seedling survival


Seed source
Seed production
Seed dispersal
Seed supply on clearcut
Germination
Germinated seedlings
Survival
Seedling survival
Annual fluctuation,
Climate conditions
Standing volume, surrounding stands
Distance to source
Species specific seed dispersal
Soil moisture
Clearcut age
Soil scarification
Slash residuals
Soil scarification
Shelter trees
Site fertility and competition
Browsing & herbivory

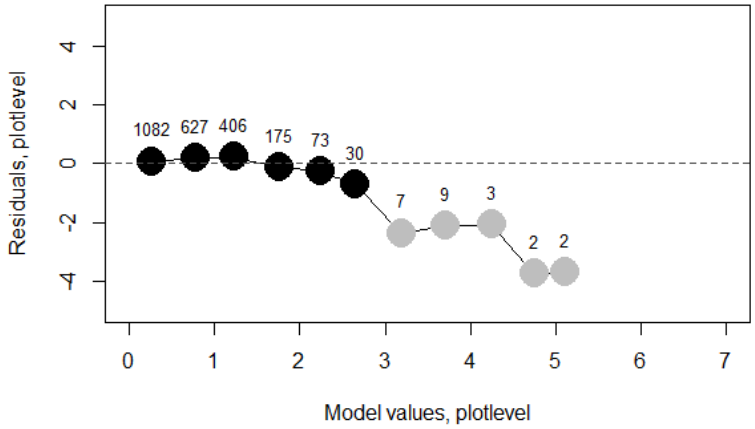


Model evaluation on site



Model seedling vs measured seedling density. Mean values for stand/regeneration site.

Model evaluation for sample plots (3 m^2)



Mean residuals against mean model values at the sample plot level in classes of 0.5 units. The number of samples for each class mean is given above the estimate.

Seed germination

Seedling survival

Soil disturbance

Increased amount of bare mineral soil will increase the likelihood of germination and survival

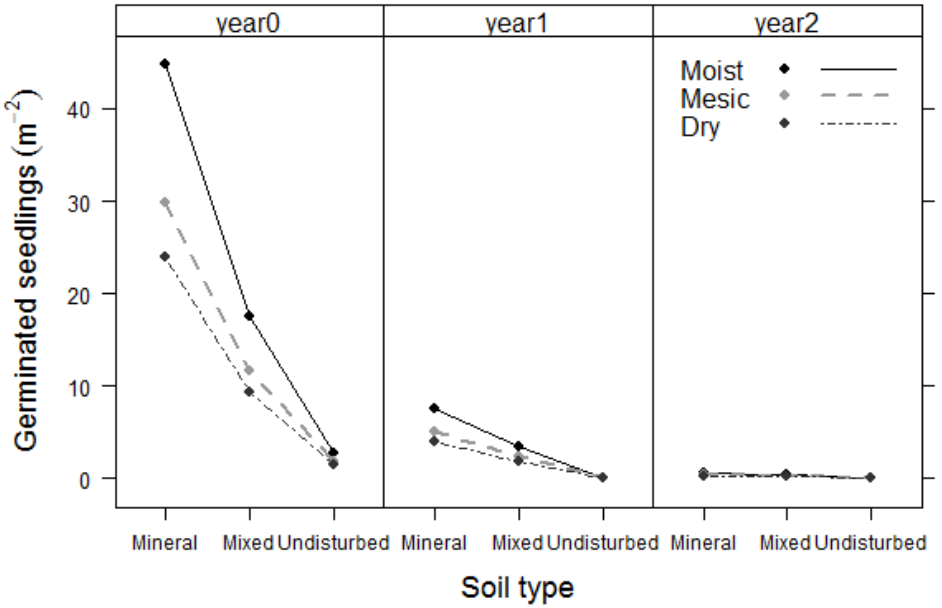
Soil moisture content

Wet and moist sites increase the likelihood of germination and survival




Seed germination

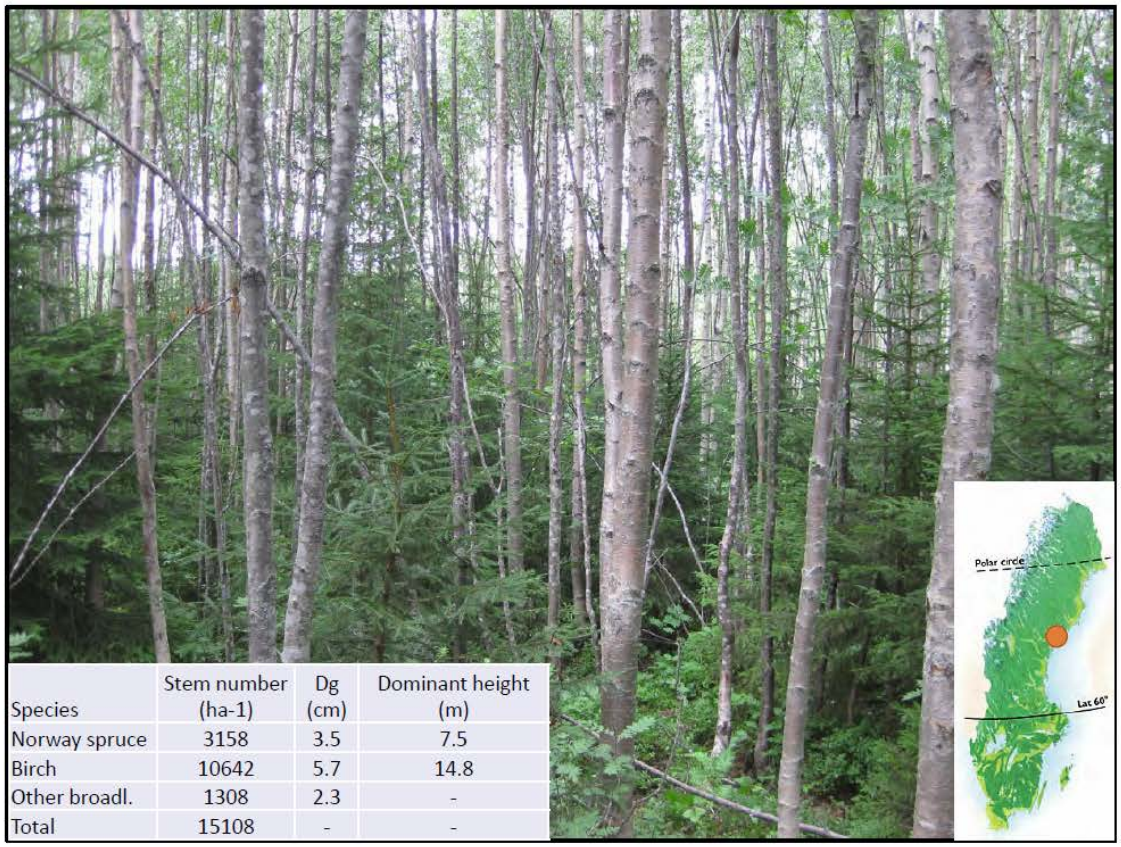
Seedling survival



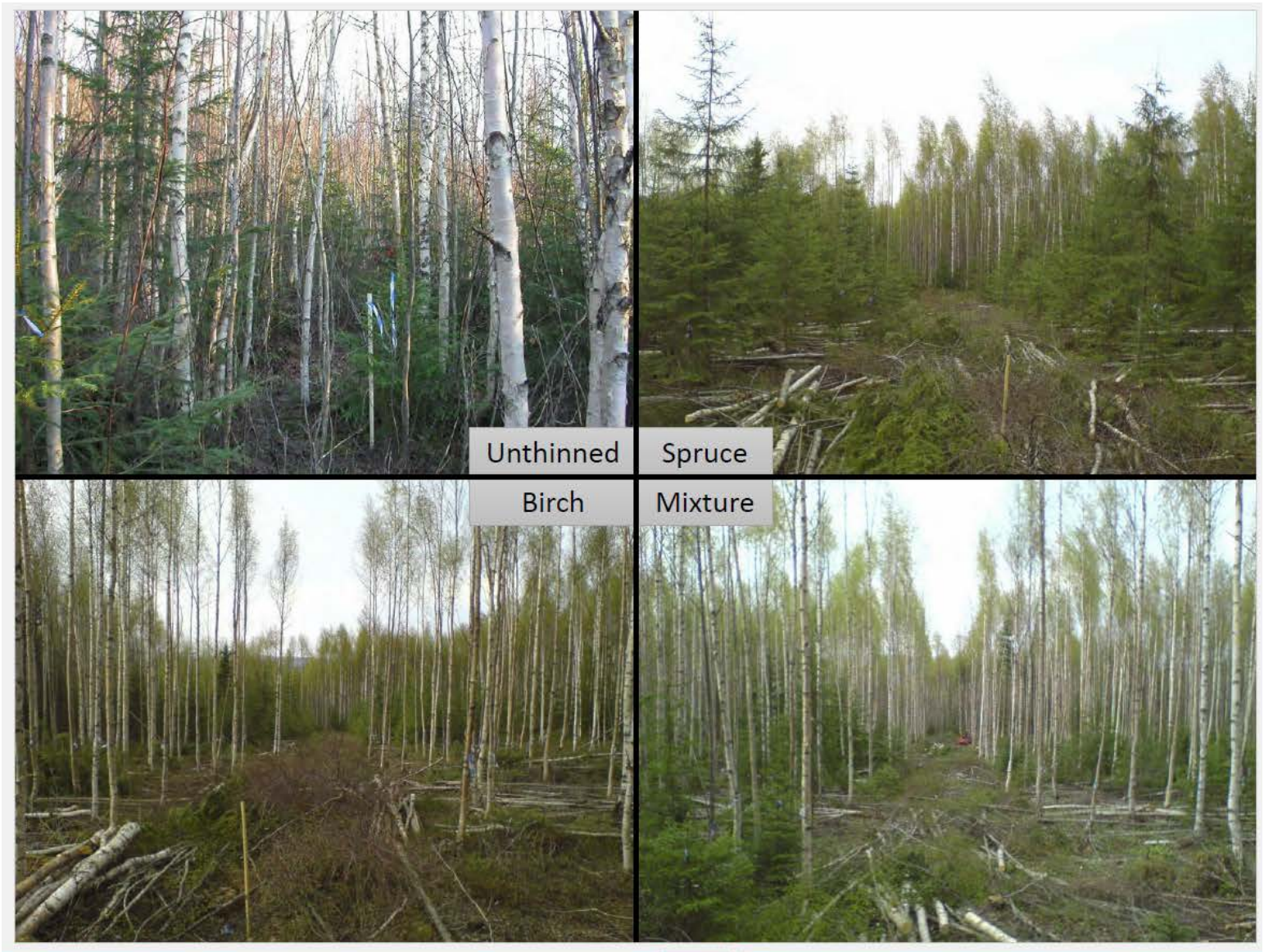
Visualization of the relation (Eq. 3) between soil type on the x-axis (mineral soil, mixed humus and mineral soil and undisturbed surface), soil moisture content (legend) and 0, 1 or 2 years after scarification in panel 1-3. The seed density is presented whit a seed fall density of 300 m^{-2}.

Early thinning of energy wood in dense mixtures of Norway spruce and birch

Nils Fahlvik
Tomas Lundmark



Species	Stem number (ha-1)	Dg (cm)	Dominant height (m)
Norway spruce	3158	3.5	7.5
Birch	10642	5.7	14.8
Other broadl.	1308	2.3	-
Total	15108	-	-


Unthinned
Spruce
Birch
Mixture


Unthinned
Spruce
Birch
Mixed

How could we improve precision in natural regenerations of birch?

- Distribution of Betula pendula and pubescens and differences in regeneration success
- Increased understanding in interaction of soil scarification and soil moisture
- Increased understanding in how site and climate interact with treatments and species

Contribute to stand development models for birch dominated forests

- Results from thinning experiments of birch and Norway spruce
- Working with models and functions from earlier research

Increase the understanding of processes in seed germination and seedling survival

- National surveys and validation of the birch regeneration model