NATIONAL DEVELOPMENT PLAN 2020

EUROPEAN UNION
European Regional Development Fund

INVESTING IN YOUR FUTURE

LATVIJAS VALSTS MEŽI

ForestValue

ASSESS EST

SILAVA

Old-growth forests in Latvia

Āris Jansons,

Laura Ķēniņa, Valters Samariks, Daiga Zute, Ieva Jaunslaviete

Kārlis Bičkovslis, Kristaps Ozoliņš, Dārta Kaupe, Nauris Īstenais,

Endijs Bāders, Andis Adamovičs, Māra Kitenberga, Jānis Liepiņš, Alise Bleive

Anna Lele, Baiba Rieksta-Riekstiņa, Sabīne Dubašinska, Nauris Siksna, Elīza Maksimova, Kristīne Riekstiņ

Diāna Jansone, Agnese Anta Liepiņa, Stefānija Dubra, Roberts Matisons

Andis Lazdiņš, Guntars Šņepsts, Zane Lībiete, Jānis Donis

Skogssällskapet

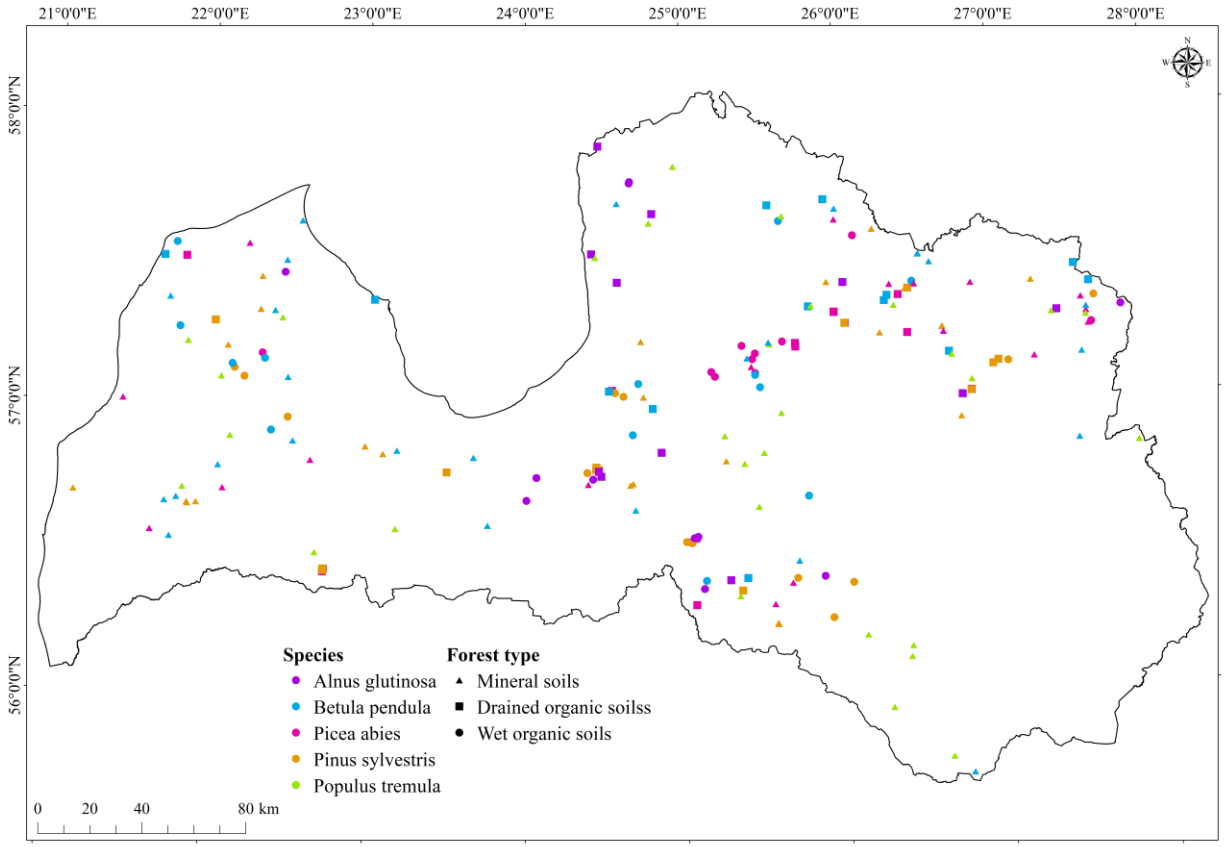
LATVIJAS MEŽU ĪPAŠUMI

INGKA INVESTMENTS

Old-growth forests in the context of climate policy: what is and what is not an old-growth forest?

12-13.10.2023.

What have we measured?



- Old trees is (still) the dominant forest element
- No detectable signs of management
- Altogether 188 stands and 1128 sample plots

○ **Old-growth forests on mineral soils:**

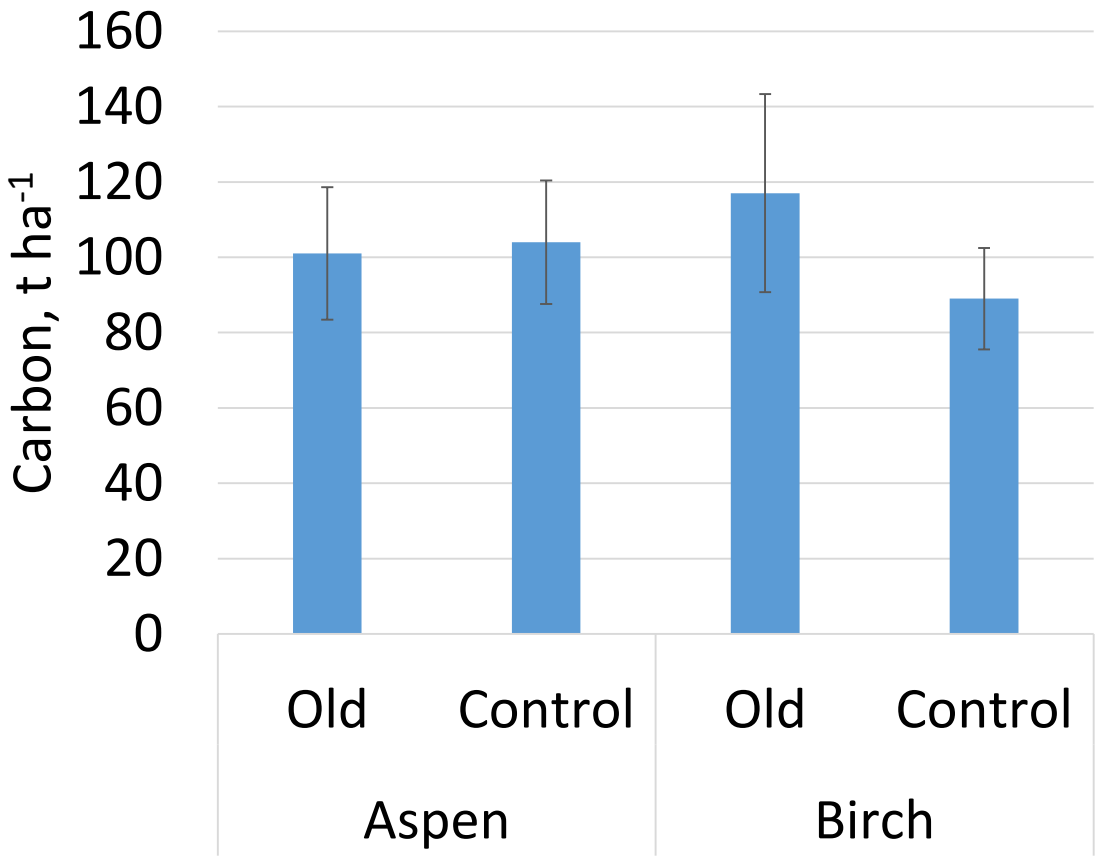
Spruce 170 to 205 years old (182 ± 2 years)
Pine 170 to 218 years old (179 ± 6 years)
Birch 123 to 148 years old (131 ± 4 years)
Aspen 104 to 135 years old (112 ± 3 years)

○ **Old-growth forests on organic soils:**

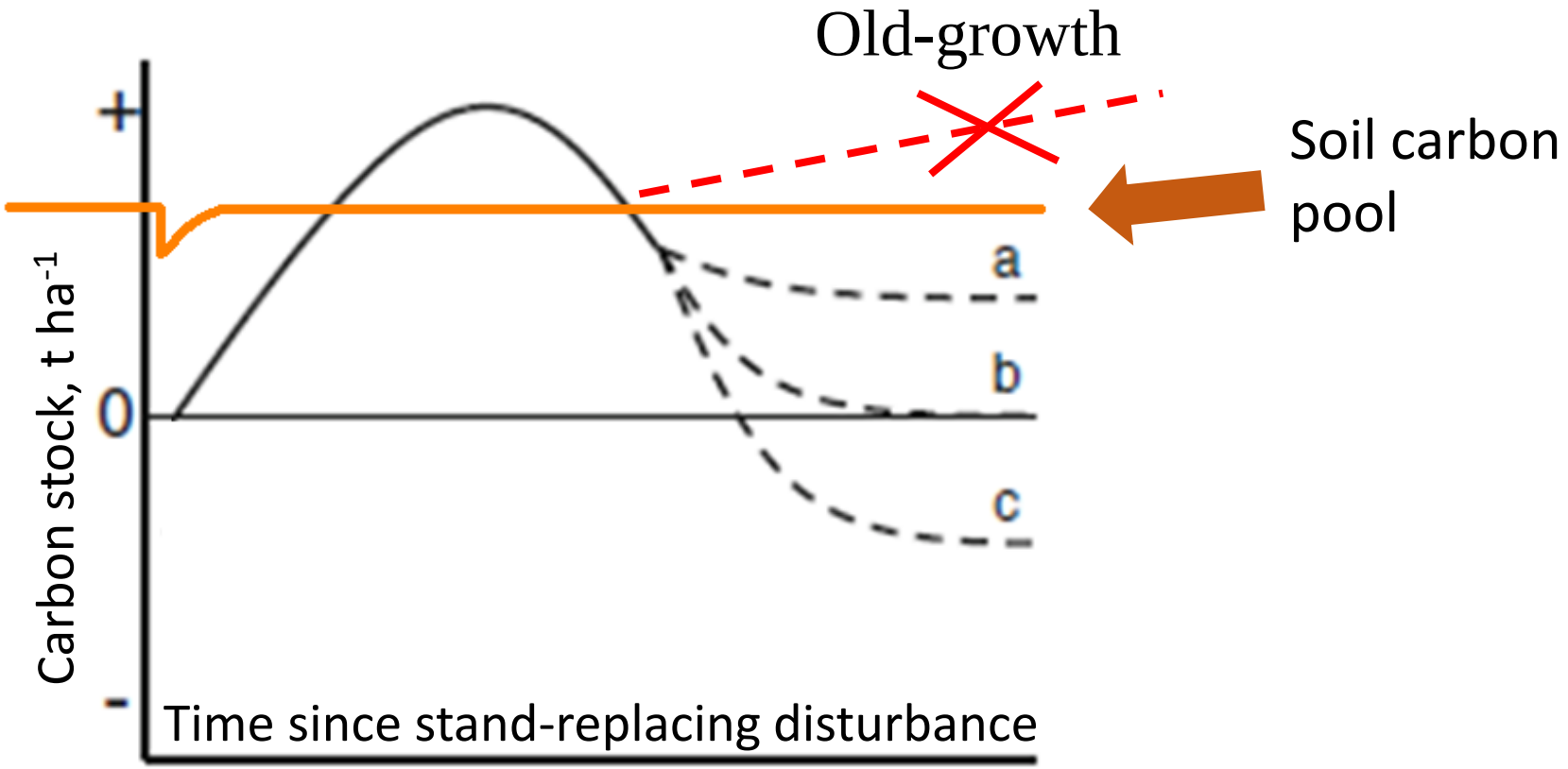
Spruce 124 to 175 years old (147 ± 7 years)
Pine 131 to 188 years old (159 ± 7 years)
Birch 111 to 164 years old (124 ± 5 years)
Black alder 111 to 146 years old (128 ± 3 years)

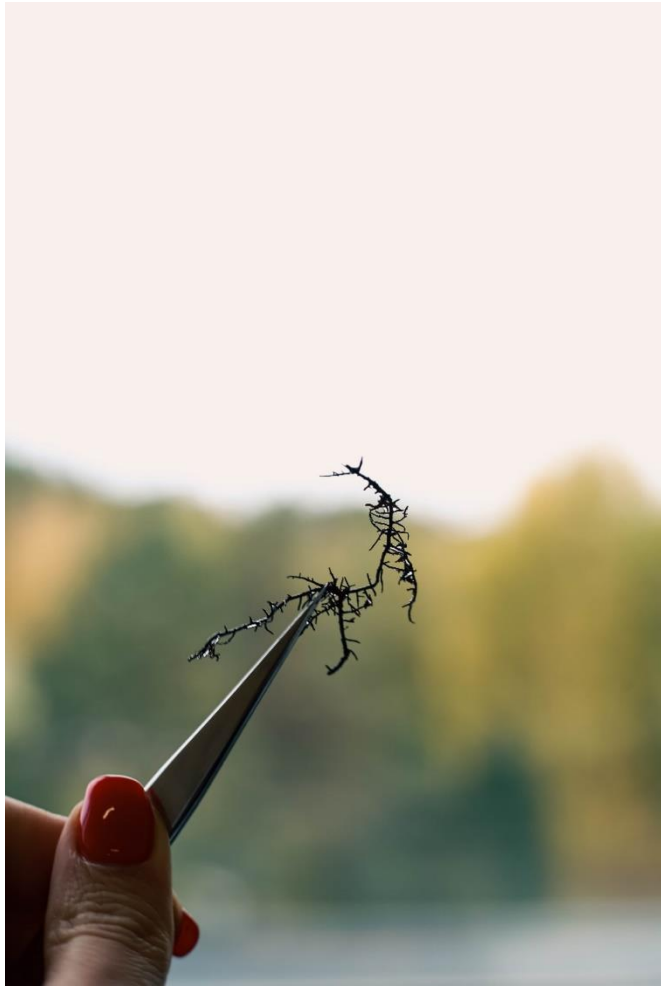
What have we found?
Carbon storage: soil- deciduous trees

Significant differences of soil carbon storage between control (age 58-69 years) and old-growth (112-131 years) birch and aspen stands on mineral soil were **not** detected



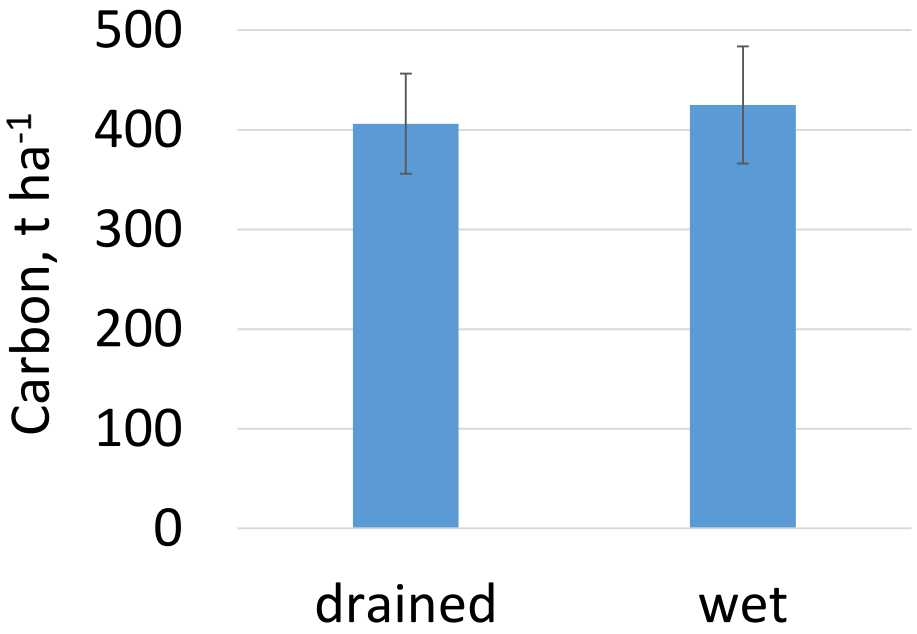
What have we found?
Carbon storage: soil- deciduous trees





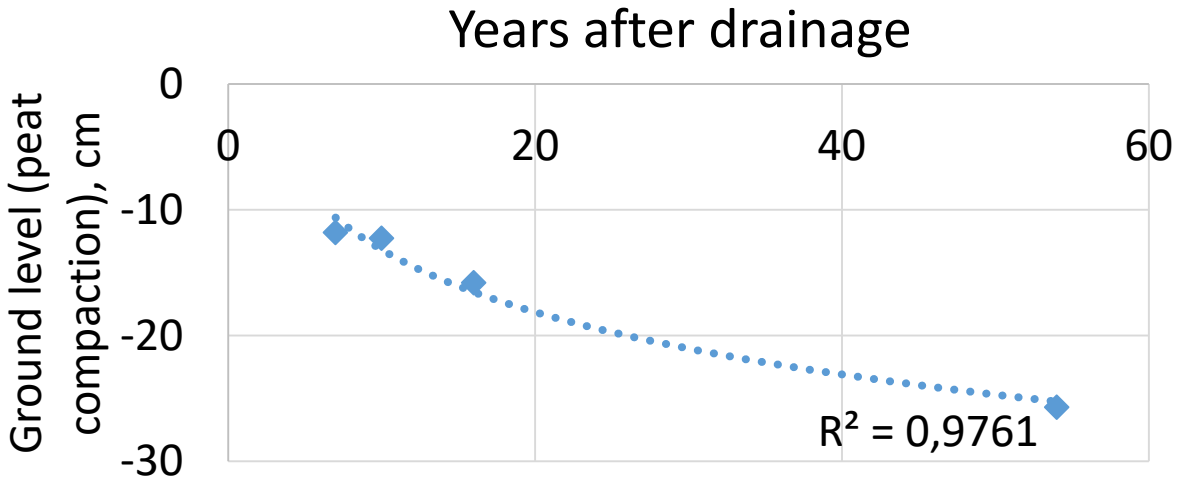
What have we found?
Carbon storage: soil- deciduous trees

Significant differences of soil carbon storage between control (age 58-69 years) and old-growth (112-131 years) birch and aspen stands on mineral soil were **not** detected



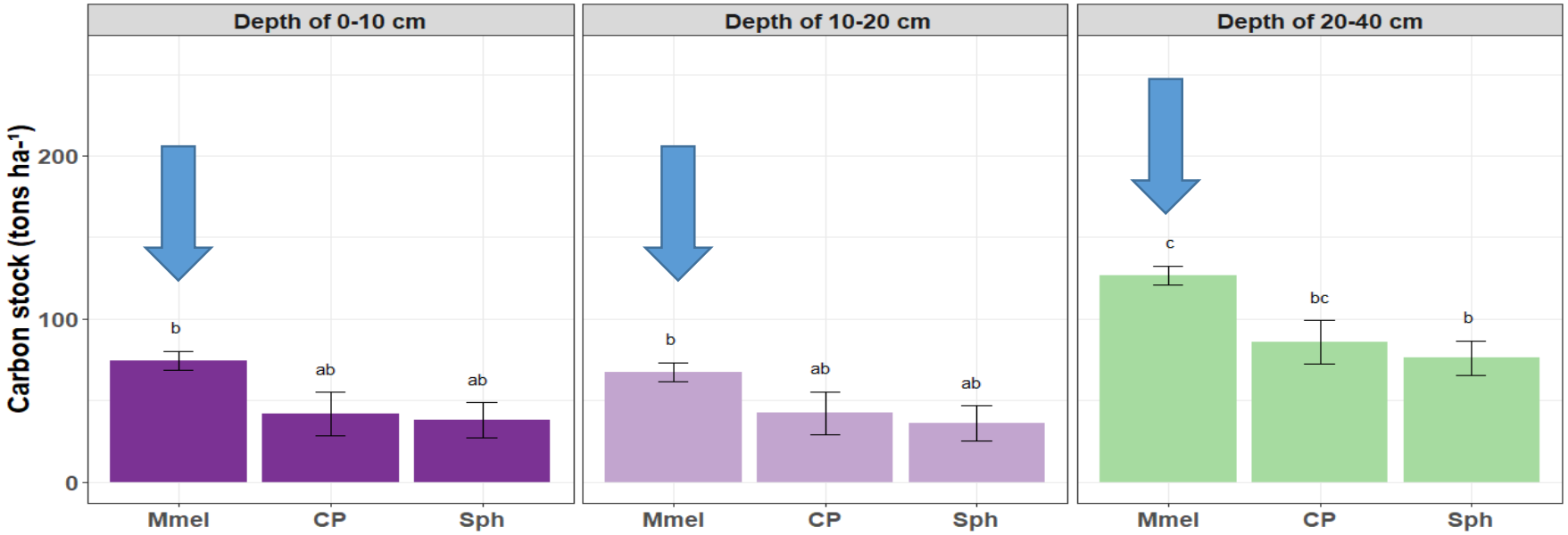
Significant differences in carbon storage between drained and undrained old-growth birch stands on organic soil were **not** detected

What have we found?
Carbon storage: soil- coniferous trees



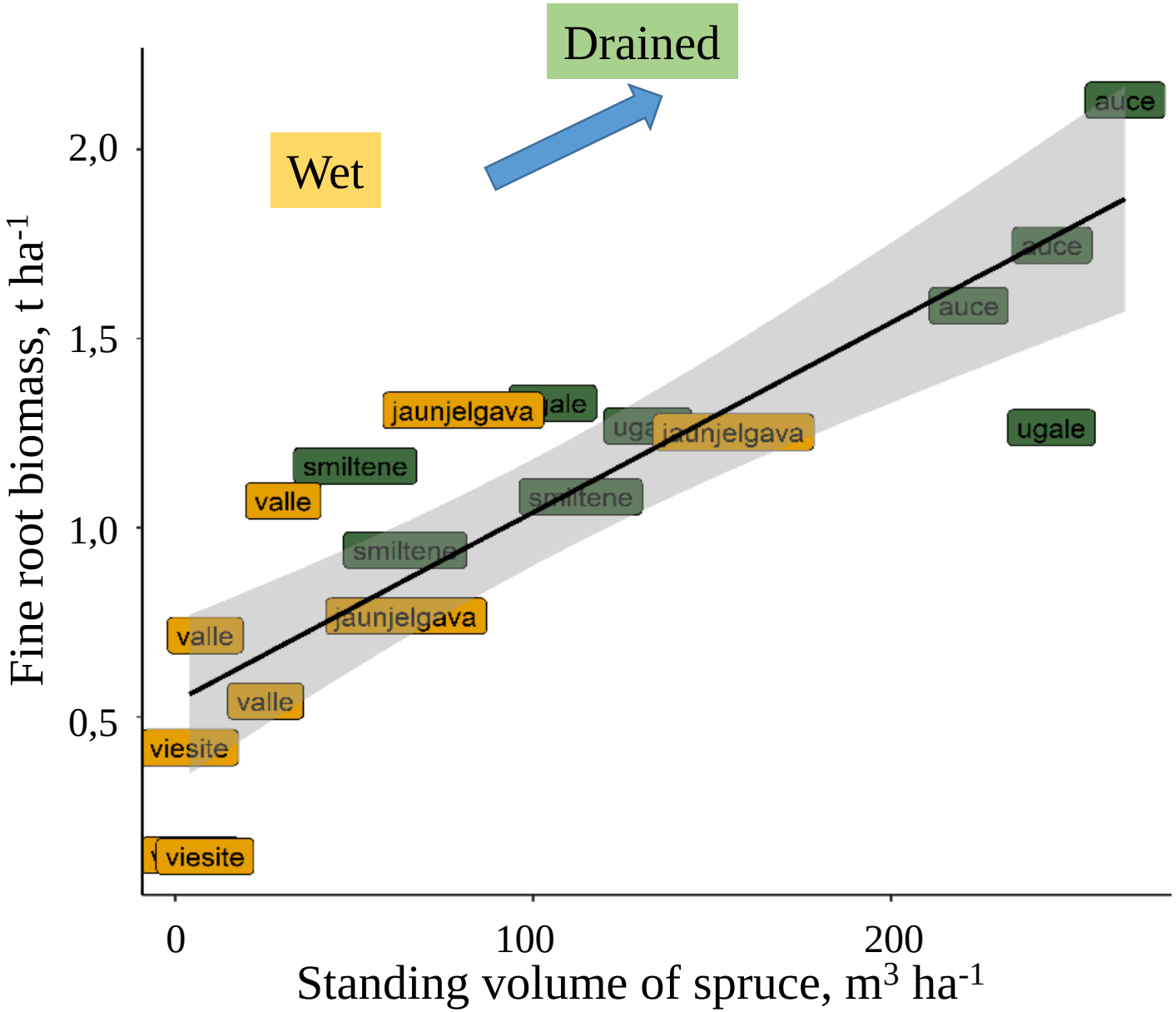
Vesetnieki study site

What have we found?
Carbon storage: soil- coniferous trees



Drainage in long-term has not depleted soil carbon stock

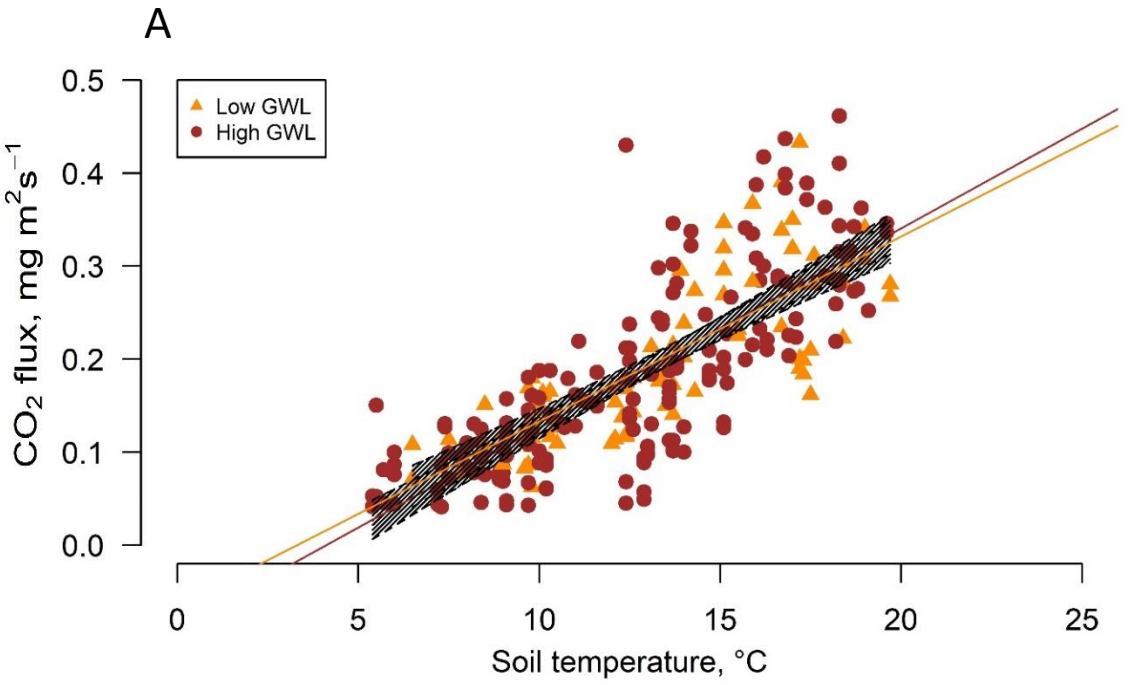
What have we found?
Changes in litter dynamics



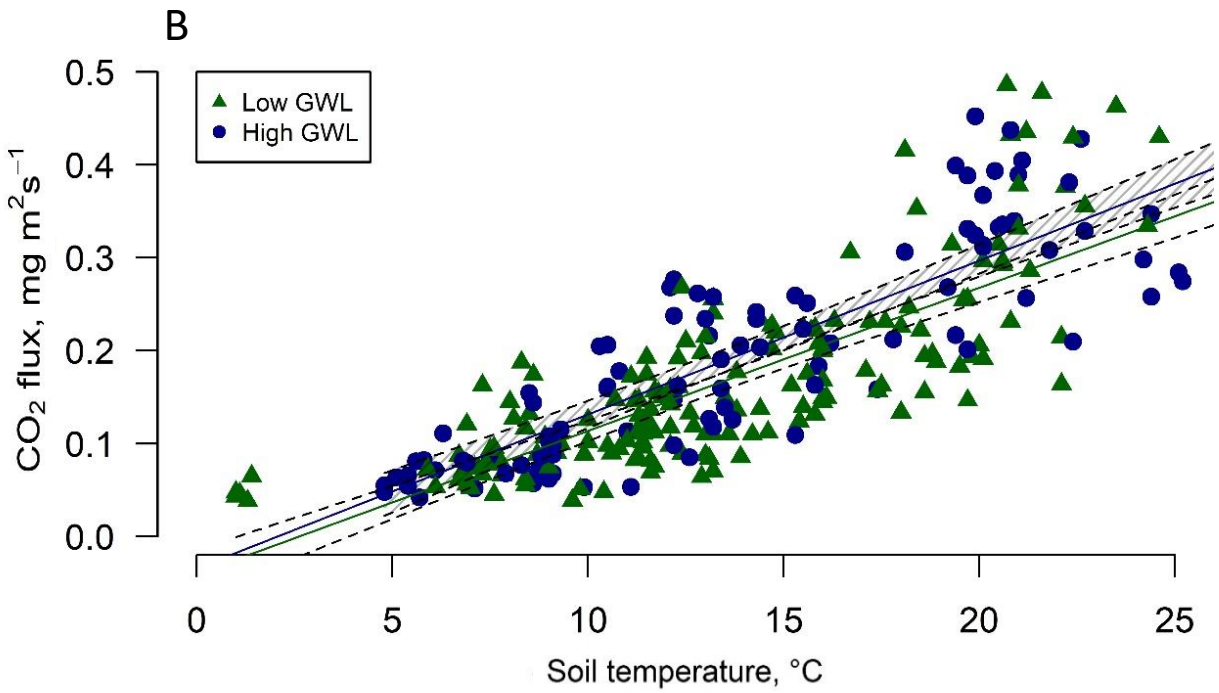
What have we found?
Emissions: soil- coniferous trees

CO_2

Scots pine



Norway spruce



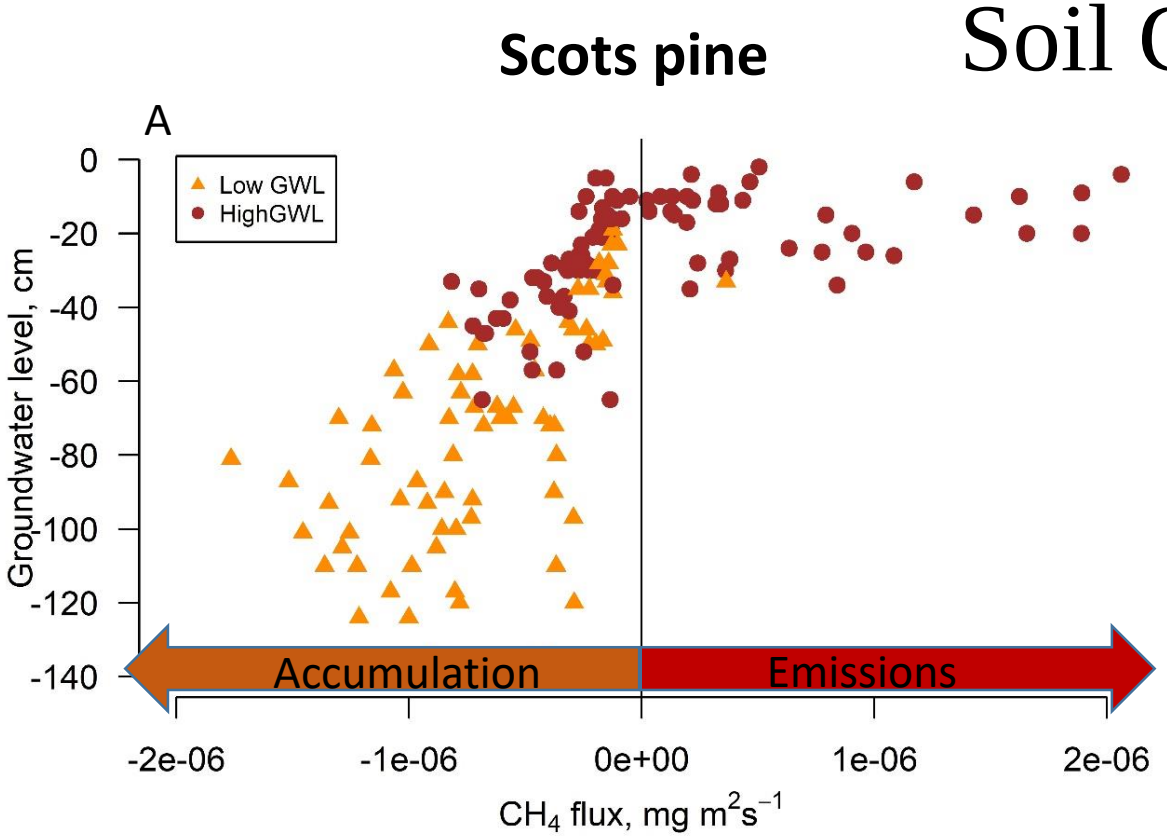
Soil total CO_2 emissions and soil temperature relationship in old-growth Scots pine (A) and Norway spruce (B) stands per groundwater level category. Grey area denotes 95% confidence interval.

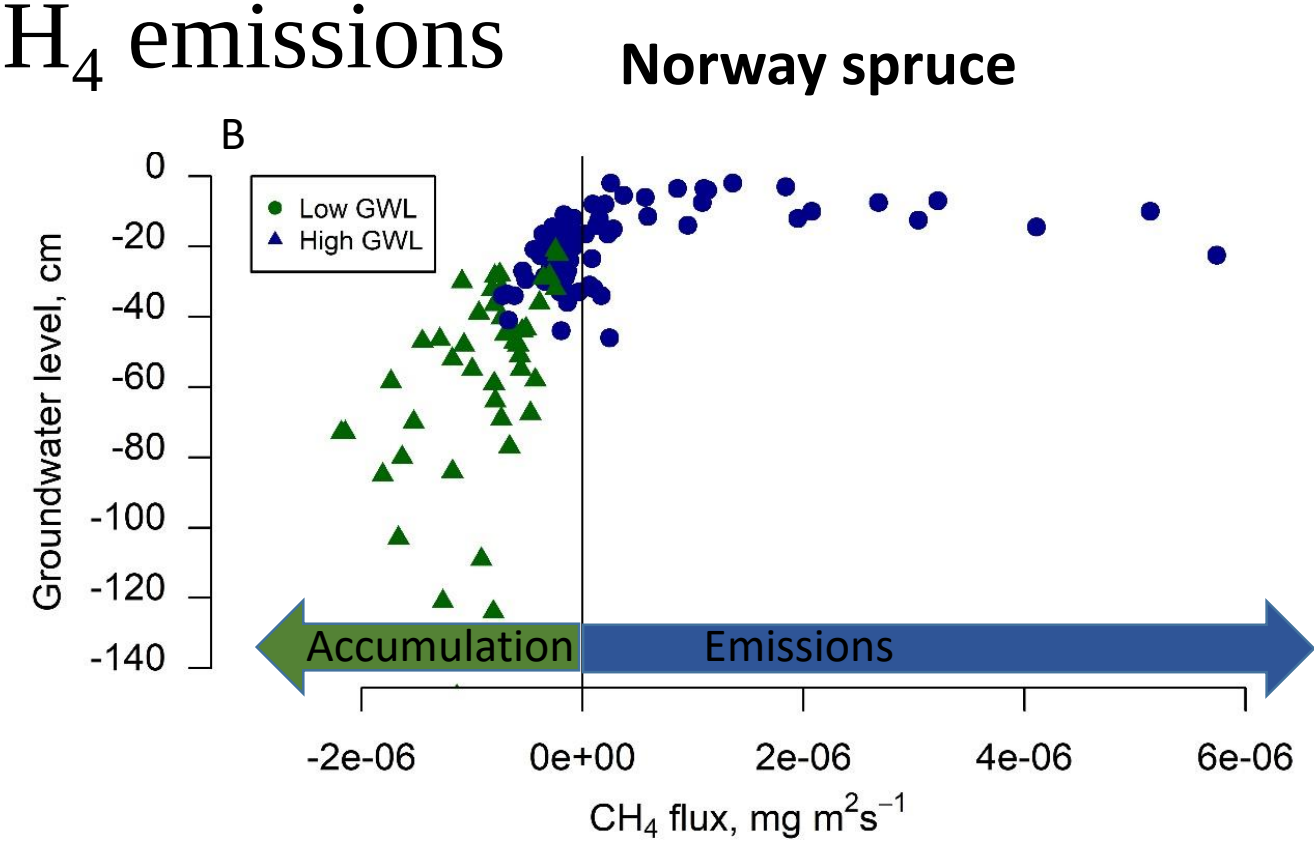
Samariks, Jansons et al., 2022, submitted

What have we found?
Emissions: soil- coniferous trees

CH_4

Soil CH_4 emissions





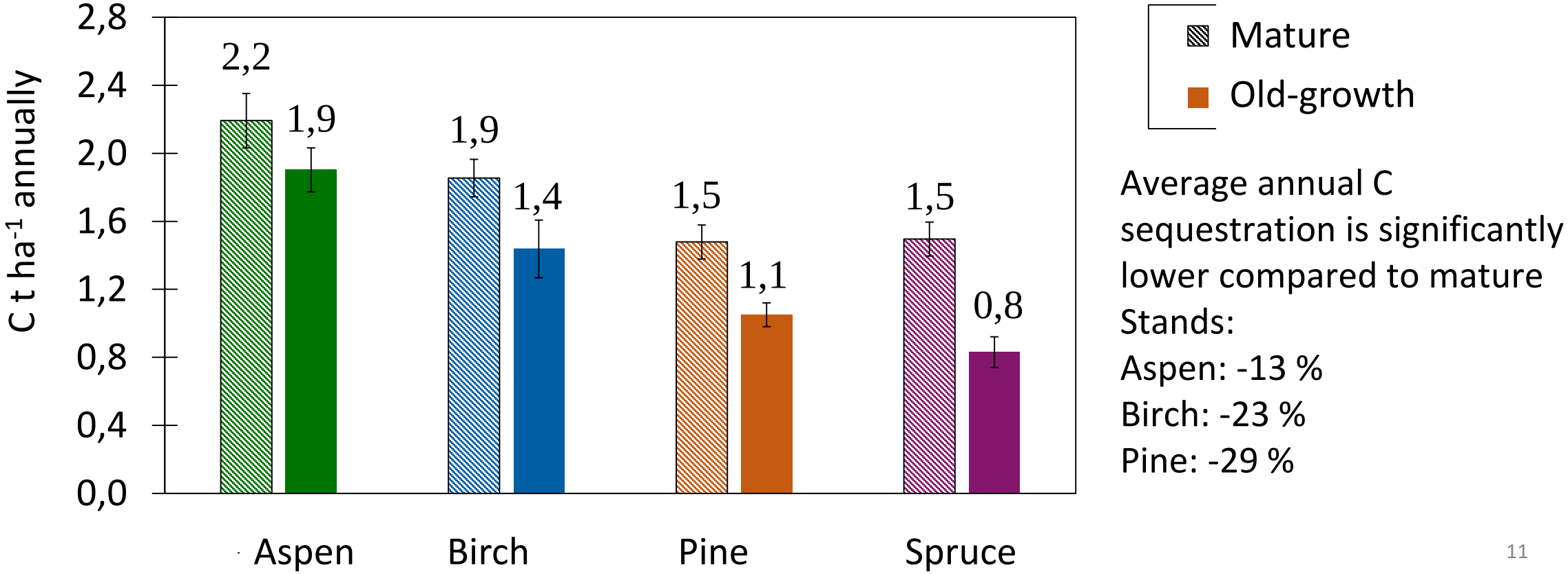
Soil CH_4 emissions and soil temperature relationship in old-growth Scots pine (A) and Norway spruce (B) stands per groundwater level category

Drainage in **long-term** has no negative effect on soil emissions

Samariks, Jansons et al., 2022, submitted

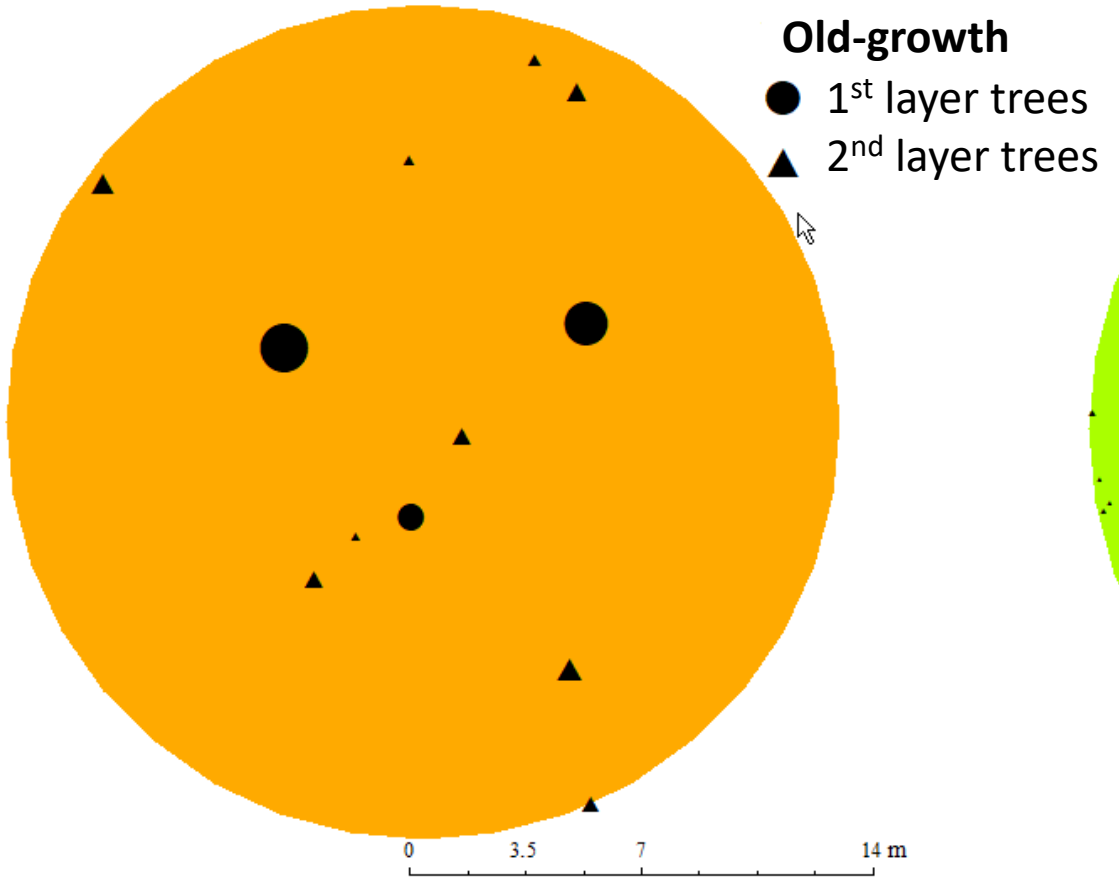
The story about the forest carbon storage is the story about trees

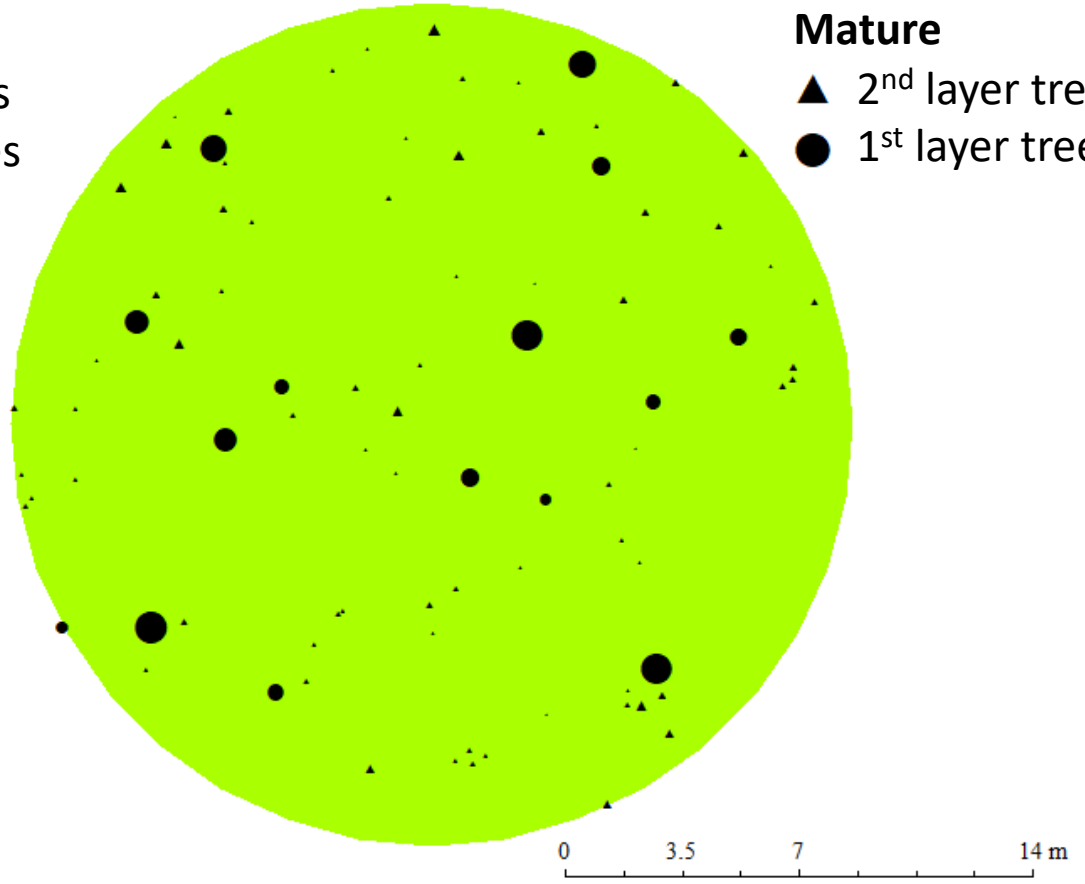
- Dominant tree species ($p < 0.001$) had a significant impact on the carbon stock.
- In the old-growth stands (104 to 218 years), in which old target-species trees still formed the dominant cohort, the total carbon stock was, on average, 20% larger than in the younger (than 54 to 103 years) control stands, the difference depending on the dominant tree species



Average annual C sequestration is significantly lower compared to mature Stands:
Aspen: -13 %
Birch: -23 %
Pine: -29 %

The story about the forest carbon storage is the story about trees





Old forest stands in our study corresponds to FAO classification n6 category – *old-growth forest* (Buchwald 2005).

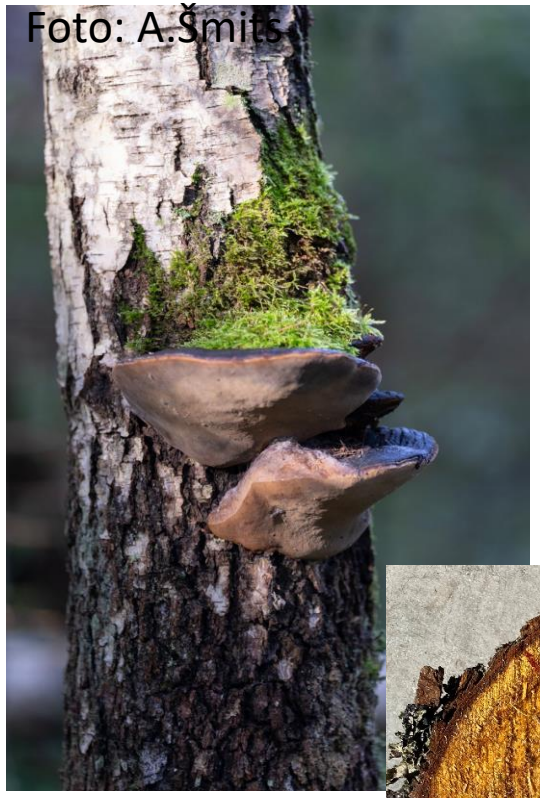
NATIONAL DEVELOPMENT PLAN 2020

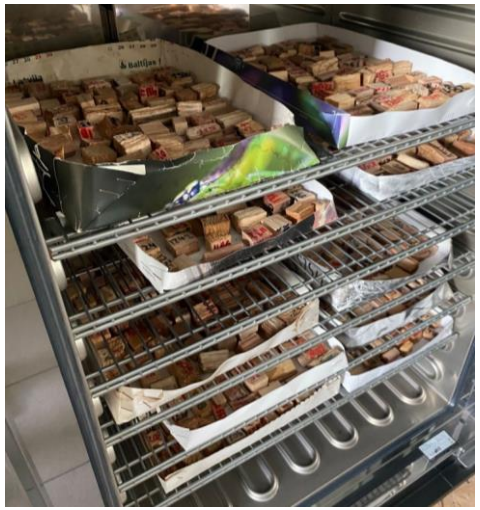
EUROPEAN UNION
European Regional Development Fund

INVESTING IN YOUR FUTURE

Tool for assessment of carbon turnover and greenhouse gas fluxes in broadleaved tree stands with consideration of internal stem decay (ERDF No 1.1.1.1/21/A/063)

SILAVA





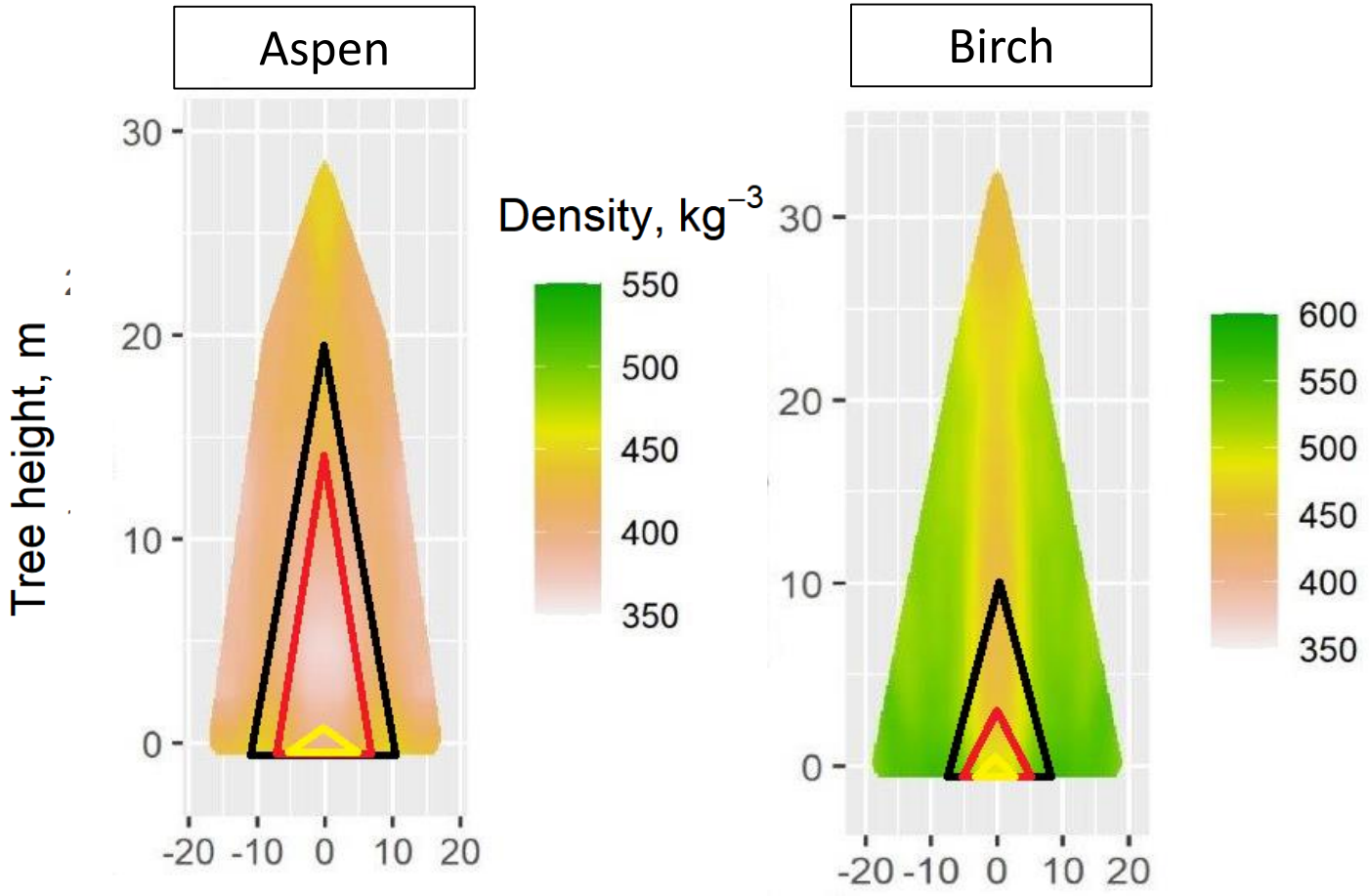


Foto: A.Šmits

Old growth forest are not effective for climate change mitigation.

So what's the point?

Old-growth forests: what's the point?

- Maintenance of biodiversity (certain aspects)
- Reference for comparison with managed forest in order to shape (adjust) management system (climate smart forestry / closer to nature forestry approaches)

Climate smart forestry

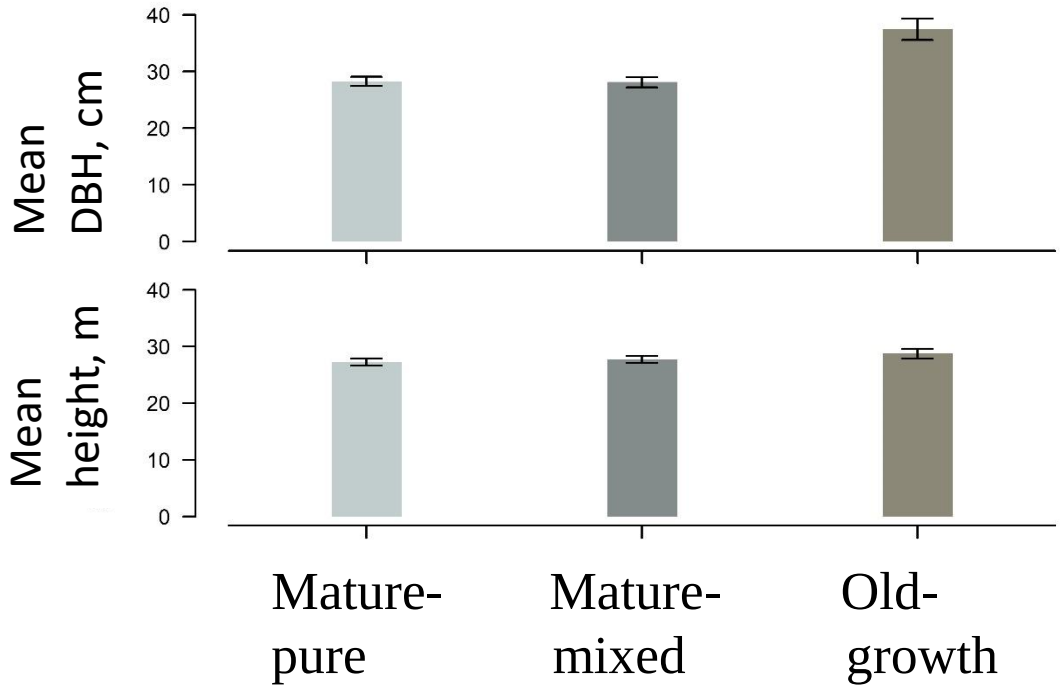
Maintenance of biological diversity

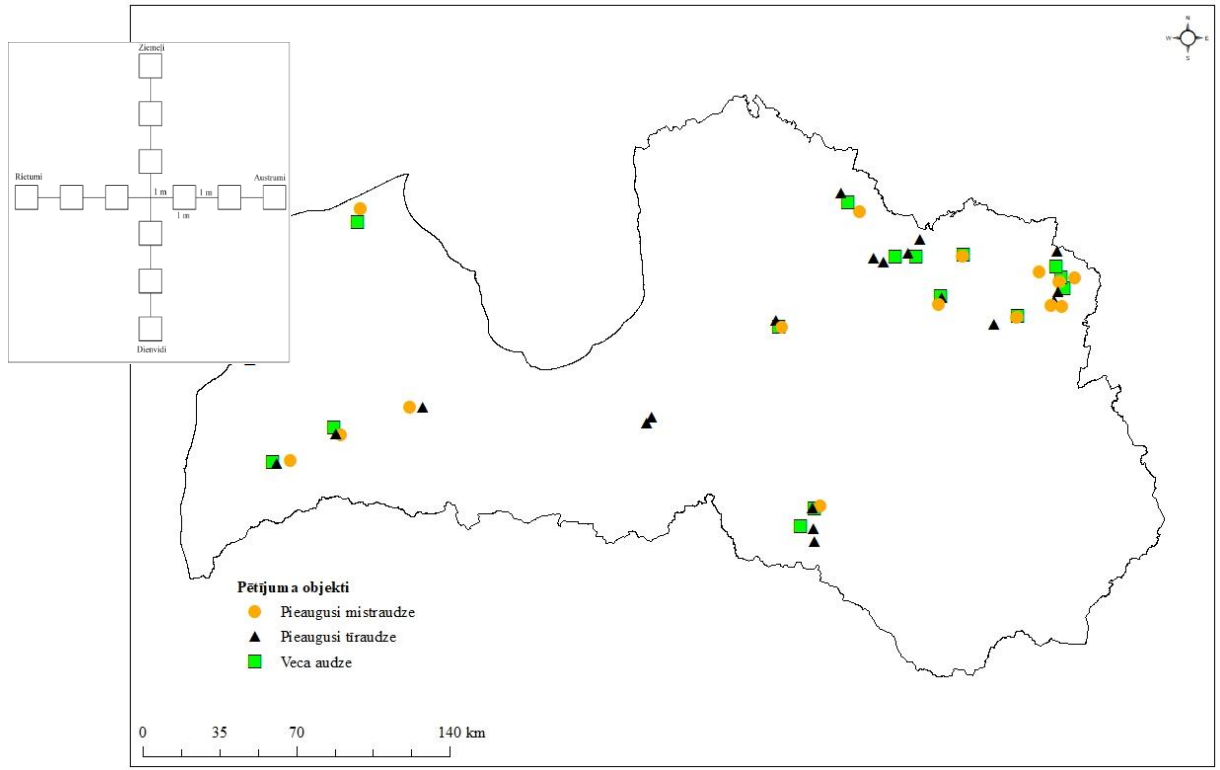
Mitigation of Climate Change and its negative effects on biodiversity and society

Adaptation to Climate Change

Foundation of bioeconomy

Old-growth stands and biodiversity: ground vegetation

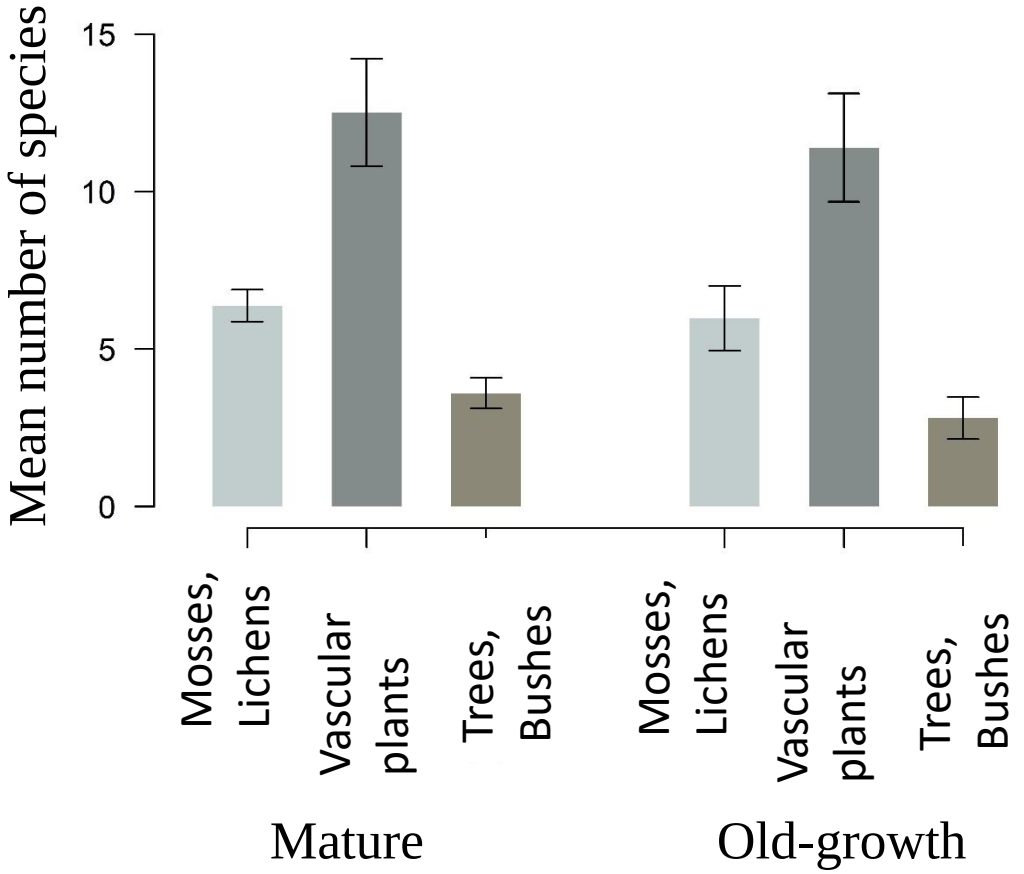


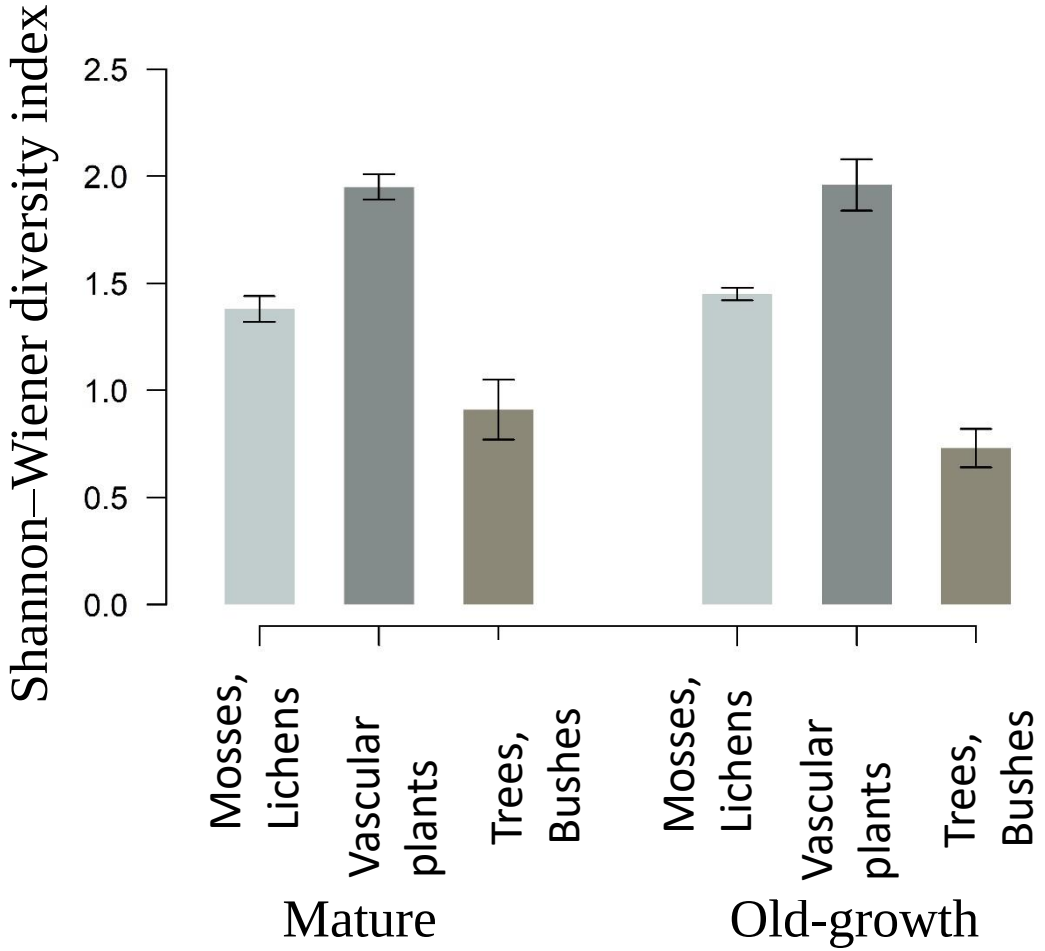


Direct comparison between mature and old-growth Norway spruce stands

Matisone et al., 2023

Old-growth stands and biodiversity: ground vegetation

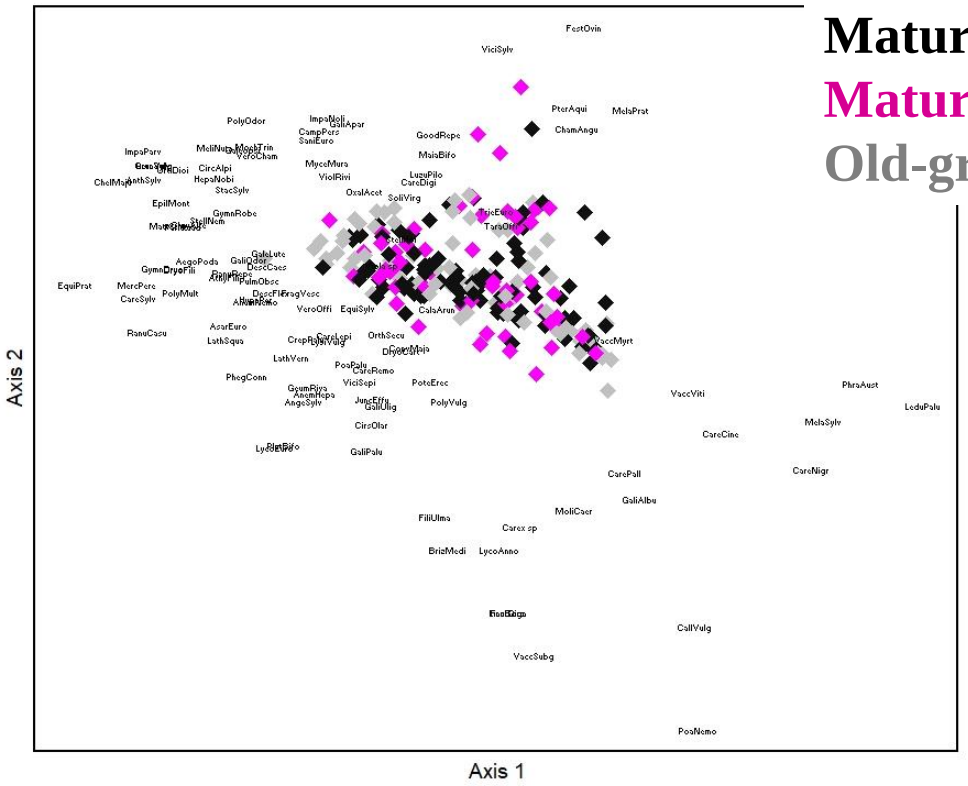




Old-growth stands and biodiversity: ground vegetation

- The principal gradients of ground cover vegetation were related to light, site fertility, and structural diversity, as well as the degree of deciduous (particularly *Betula* spp.) admixture in a tree stand.
- Stand age (differing two time between assessed groups) did not affect ground cover vegetation, implying the principal effects of stand structure, which is manageable characteristics.

PCA of ground vegetation

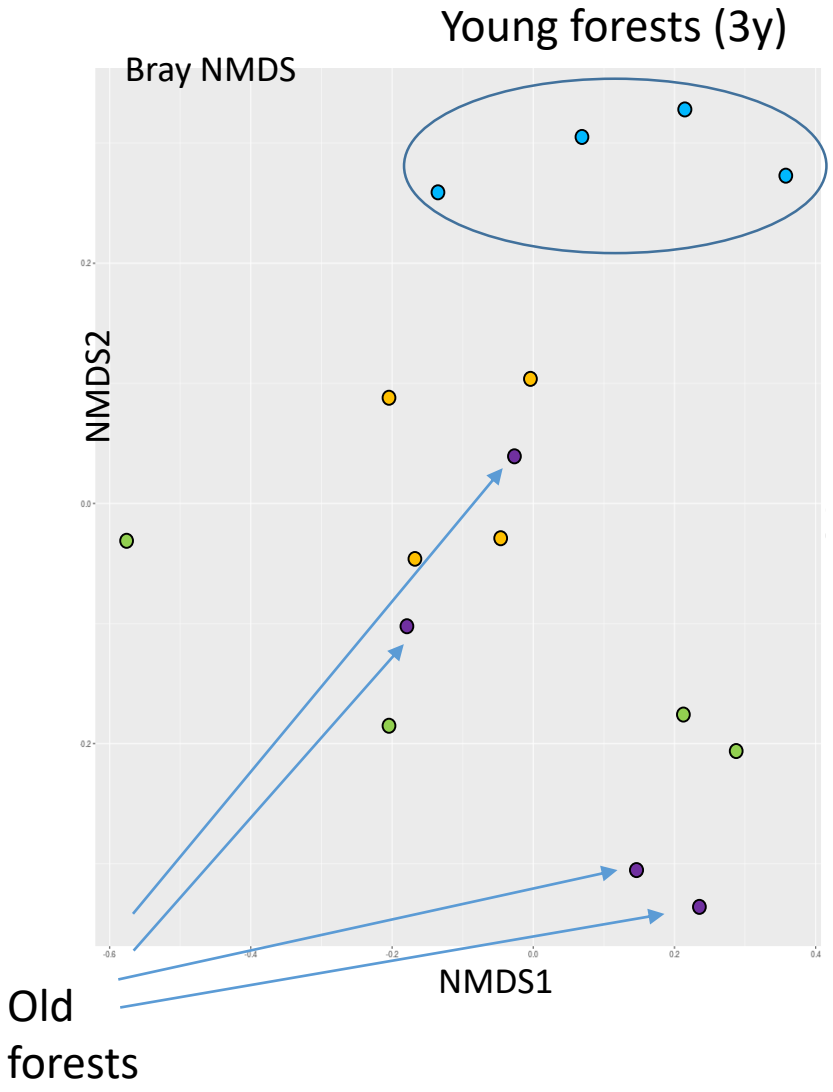


Mature-pure
Mature-mixed
Old-growth

Platanthera bifolia
Lycopodium annotinum

Old-growth stands and biodiversity: fungal diversity

- 7,7 million reads were obtained in two sequencing sessions, of which only 1,6 million were left after quality filtering. 523848 sequences were detected as ITS by ITSx. CD-HIT clustered these sequences in 2564 OTUs.
- Preliminary results showed high operational taxonomic unit (OUT) richness in the samples, but community composition in general was significantly different between plots in each of the sites. Soil variables did not explain differences in fungal communities.
- Bray-Curtis ordination showed that only the clearcut samples formed a distinct OTU cluster.



Biodiversity maintenance and production

Plantation of birch

Plantation of Norway spruce

(Potential) negative effect of plantations on biodiversity mostly is the result of :

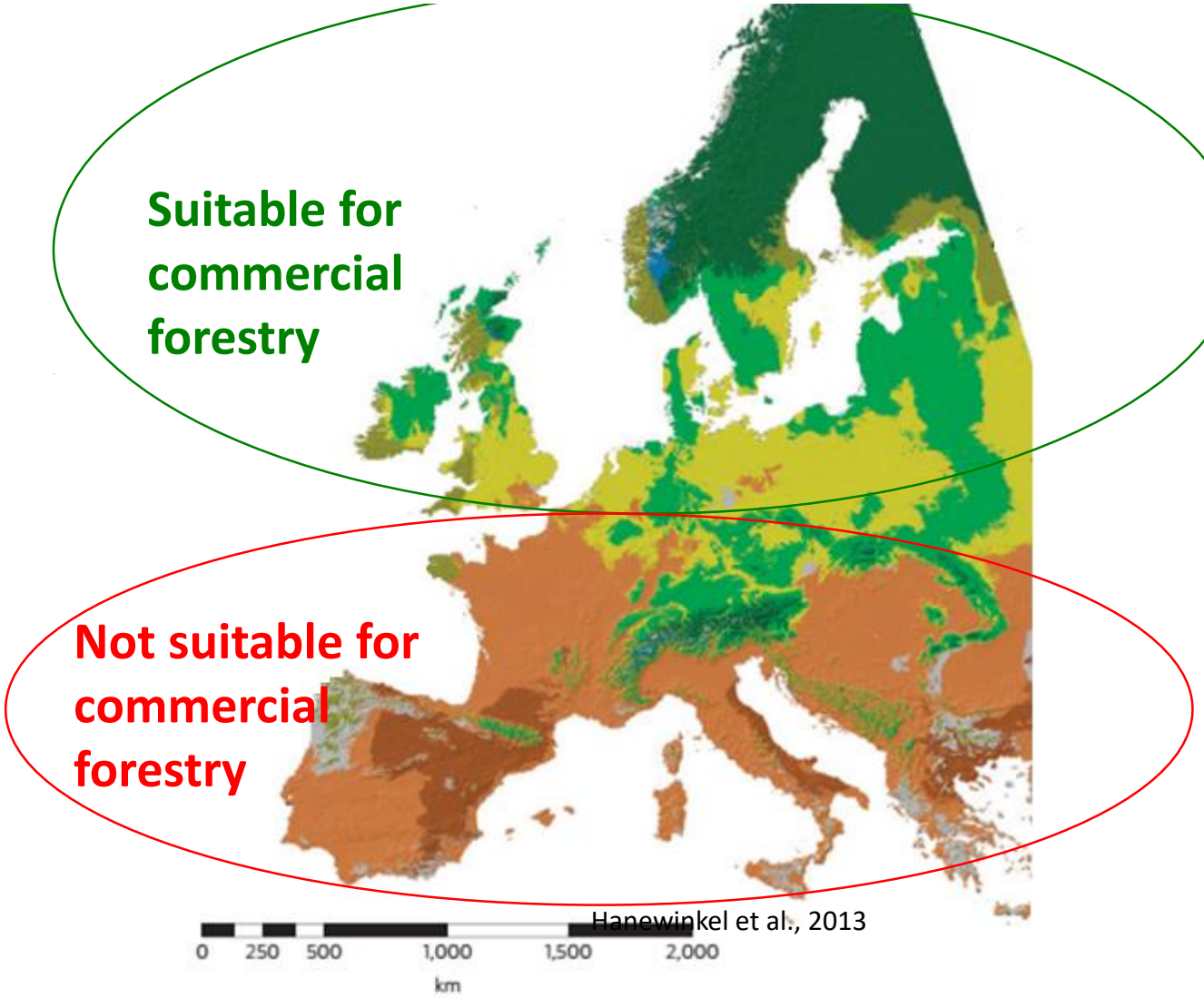
1) their management approach;
2) Their scale and allocation in landscape

Effective management can be combined with maintenance of elements of biodiversity at stand or landscape scale (triada principle)

Why does it all matter?

To ensure the best aggregate outcome of the society from the limited land resource

Effect of Climate Change by the end of the century



Hanewinkel et al., 2013

Take-home messages

- In recognizing that tree biomass is the largest and most dynamic carbon pool in old-growth stands, it is recommended that in forest areas where climate change mitigation is the main management objective, a forest model be used that ensures stands that are the most productive and highly resistant to natural disturbances.
- In forest areas where the primary management objective is the maintenance and protection of biodiversity, it should be taken into consideration, that the carbon storage efficiency (mean annual difference in carbon stock) in tree biomass and deadwood decreases significantly between the younger (control) and old-growth stands. Old-growth forests continue to accumulate carbon in old age, but their uptake decreases over time, until the dominant forest element changes due to tree aging and/or the impact of the natural disturbance.
- Drainage does not deplete the soil carbon pool over a long term

Tool for assessment of carbon turnover and greenhouse gas fluxes in broadleaved tree stands with consideration of internal stem decay (ERDF No 1.1.1.1/21/A/063)

SILAVA

Thank you!

aris.jansons@silava.lv
+371 29109529