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Dynamics of mixed-species forests in changing climate – how different species combinations adapt to climate change?

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Objectives

- Assess how varied initial proportions of tree species affected production in mixed stands.
- Evaluate the biomass production and carbon sequestration potential of biomass and soil in mixed stands in a changing climate.

Figure 1. Dynamics of the biomass proportion of different species in mixed birch–pine stands at different initial proportions of species (upper row) and difference (%) between proportions of pine in total stand biomass at climate change scenario in comparison to current climate (lower row). X axis – simulation step (0–100 years).

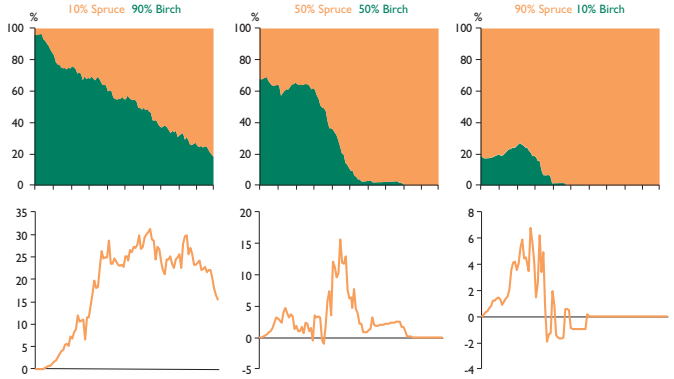

Figure 2. Dynamics of the biomass proportion of different species in mixed birch–spruce stands at different initial proportions of species (upper row) and difference (%) between proportions of spruce in total stand biomass at climate change scenario in comparison to current climate (lower row). X axis – simulation step (0–100 years).

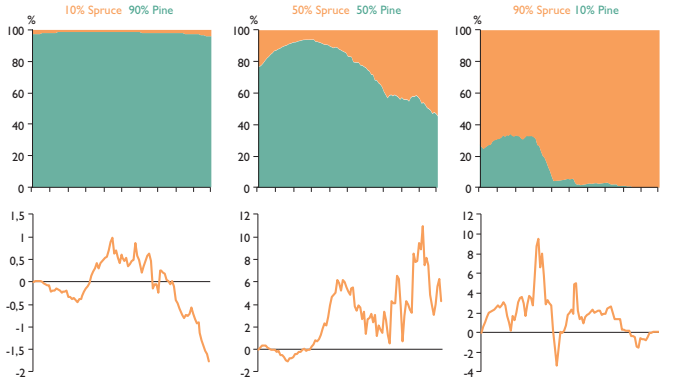

Figure 3. Dynamics of the biomass proportion of different species in mixed pine–spruce stands at different initial proportions of species (upper row) and difference (%) between proportions of spruce in total stand biomass at climate change scenario in comparison to current climate (lower row). X axis – simulation step (0–100 years).

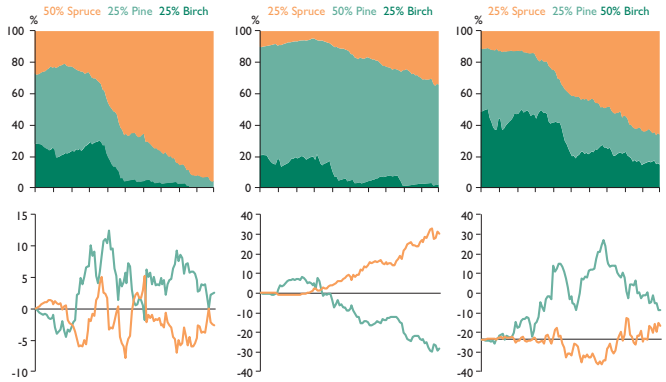

Figure 4. Dynamics of the biomass proportion of different species in mixed birch–pine–spruce stands at different initial proportions of species (upper row) and difference (%) between proportions of pine and spruce in total stand biomass at climate change scenario in comparison to current climate (lower row). X axis – simulation step (0–100 years).

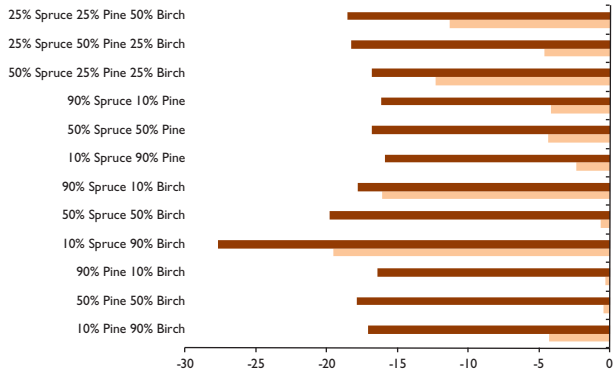

Figure 5. Changes (%) of carbon stocks in mineral soil and forest floor during the simulation period (0–100 years) at climate change scenario in comparison to current climate.

Conclusions

- Competition for resources under conditions of climate change shifts species composition, due to changes in allocation of carbon and nitrogen to the more competitive species which require more nutrients.
- In all scenarios, climate change positively affected the productivity of standing biomass, mainly due to increased amount of available nitrogen.
- Climate change also resulted in increased rate of soil organic matter decomposition. This led to decrease in soil carbon stocks.
- The overall effect of two above processes was the increase of total carbon stock in forest ecosystems.

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