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Aboveground and belowground competition between willow Salix caprea its understory

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The effects of aboveground and belowground competition with the willow S. caprea on its understory plant community were studied in unreclaimed post-mining sites. Belowground competition was evaluated by comparing (i) frames inserted into the soil that excluded woody roots (frame treatment), (ii) frames that initially excluded woody root growth but then allowed regrowth of the roots (open-frame treatment), and (iii) undisturbed soil (no-frame treatment). These treatments were combined with S. caprea thinning to assess the effect of aboveground competition.
Three years after the start of the experiment, aboveground competition from S. caprea (as modified by thinning of the S. caprea canopy) had not affected understory biomass or species number but had affected species composition. In contrast, belowground competition significantly affected both the aboveground and belowground biomass of the understory. The aboveground biomass of the understory was greater in the frame treatment (which excluded woody roots) than in the other two treatments. The belowground biomass of the understory was greater in the frame than in the open-frame treatment. Unlike aboveground competition (light availability), belowground competition did not affect understory species composition.
Our results suggest that S. caprea is an important component during plant succession on post-mining sites because it considerably modifies its understory plant community. Belowground competition is a major reason for the low cover and biomass of the herbaceous understory in S. caprea stands on post-mining sites.