

Seedling recruitment of *Larix decidua* and *Picea abies* along an elevational gradient across a treeline ecotone in the Swiss Alps



Master's thesis in Environmental Sciences ETH Zurich

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January 2015

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Summary

This Master's thesis is part of the Global Treeline Range Expansion Experiment, a globally distributed collaborative project, aiming at testing the factors that limit seedling recruitment near treeline and contributing to a widely supported prediction of future treeline expansion in response to current climate warming. The study was conducted at three experimental sites along an elevational gradient at the research site Stillberg near Davos (Grisons, Switzerland): a subalpine Larch-Spruce forest, a dense short-grown alpine shrub and herb vegetation at the treeline, and an alpine meadow. In 2013, a full factorial experiment has been established at each site with randomly assigned experimental plots. On half of the plots, seeds from low and high elevation provenances of two conifer species, *Larix decidua* and *Picea abies*, were seeded in two consecutive years (2013 and 2014). Furthermore, a substrate treatment (soil surface scarification) and a post-dispersal seed and seedling predator exclosure treatment (cages) were applied on half of the plots. Seedling recruitment was assessed by measuring germination, survival and growth. Seedlings were measured in October 2013 and four times from June to September 2014. Germination and survival were analysed with generalized linear mixed models and growth with linear mixed models.

In this treeline ecotone, seedling recruitment was influenced by different site conditions. At the treeline and alpine site, recruitment occurred, whereas at the forest site almost no seeds germinated. The lack of recruitment at the forest site was mainly due to the inhibiting effect of the understorey vegetation with strongly reduced light availability at the soil surface. Seed source was considerably limiting, as no natural recruitment was found without seeding at any of the sites. Bare ground facilitated recruitment by reducing the competing effect of vegetation, indicating substrate limitation, especially at the treeline site. Other factors slightly influenced recruitment, such as predation, seed species and provenance, and interannual variation. Although seed source and substrate limitations are determining the early seedling stages in this treeline ecotone, also other factors might become important in later tree life stages and contribute to future treeline expansion in response to climate change.