

History, distribution and genetic diversity of natural populations and planted stands of *Pinus cembra* (Pinaceae) in Western Prealps: conservation and silvicultural implications.

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Between the 19th and the early 20th century, large-scale afforestation projects were undertaken in Swiss Prealps, a region that had been massively deforested for timber exploitation and livestock farming. The Swiss stone pine (*Pinus cembra* L.), an emblematic alpine tree with an important economic potential and conservation value, was one of the species used in these afforestation efforts. During this study we investigated the distribution of all known planted stands and native population in the canton of Fribourg. We compared their genetic diversity and structure by sampling 12 populations from planted and native origins and genotyping 11 microsatellites markers. The genetic structure of populations from Fribourg was then compared to other populations from the whole alpine distribution range of the species. We discovered that between the years 1885 and 1913, artificial afforestation was carried out in the mountainous regions of the canton of Fribourg. About 400'000 seedlings of *P. cembra* were planted in these sites. One century later, a total of about 650 trees survived (< 0.2 % of all planted trees) and no natural regeneration can be observed in afforested stands. By analyzing the conditions in which native populations of *P. cembra* grow in the canton of Fribourg we could conclude that conditions were significantly different in planted sites. The genetic diversity between planted and native populations showed no diversity loss in planted stands which display a comparable or even higher genetic diversity than native populations. Our genetic structure analysis allowed us to discover that the seeds used for plantations were likely not collected in the canton of Fribourg. We identified at least two potential sources for planted stands; near the frontier of Switzerland and Austria and further east between Austria and Italy. Since no harvest activities were undertaken in the planted stands, the whole afforestation campaign of *P. cembra* in canton of Fribourg can be described as a failure. We argue that the lack of knowledge or of consideration of the exact ecology of the species can be an important factor leading to this failure. As seeds used for plantation were genetically diverse it may also have been the genetic structure of the chosen ecotypes that were maladapted to local conditions. This study highlights the importance of precise understanding of species ecology and care in the choice of seeds used for plantation, especially in a context of large-scale afforestation projects anticipating and mitigating negative effects of global warming.

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