

## **Impacts of climate and land-use changes on mountain forests in Central Apennines**

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The present study aims to analyze the vegetation dynamics of *Pinus mugo* Turra subsp. *mugo* and *Fagus sylvatica* (L.) at the treeline ecotone between the closed beech forest and the mountain pine krummholz vegetation. This transitional ecosystem zone dominates the high altitudes of the Majella massif, (Central Apennines) and represents the exception on the Apennines chain being treeline dominated by krummholz with mountain pine. This species in the Majella National Park is re-colonizing open areas both upward, to the alpine meadows, and downward, to areas potentially suitable by beech expansion. On the Apennine chain, Central Italy, global change could cause a negative impact on the spatial distribution of rare or endemic species, thus influencing the appearance, structure and productivity of the tree-line ecotone. Mountain pine, growing over the treeline, represents a very sensitive species to the effects of climate change acting in Mediterranean basin. In four sampling site a circular area of 40 m in diameter was established between beech forest and mountain pine krummholz. For both species, dendrometric parameters were collected and woody cores were extracted. During sampling, basic information, to define the growth dynamics and competition between the two species, were also recorded. A landscape analysis from aerial photographs provided information to better understand the development dynamics of the two plant communities. The dendrochronological analysis, supported by dendrometric parameters, defined the population age, as well as the time of settlement. Climate-growth relationships was analyzed and showed responses, in terms of plant growth, to the current climate trend. The influence of temperature and precipitation on tree growth during the vegetation season was demonstrated by significant correlation coefficients, particularly for spring and summer temperatures and summer precipitation, in both species. An interesting result is the negative correlation of temperature (max and min) during spring and summer months with beech growth in all sites; the exception was the site located at 2100 m, where summer temperatures correlate positively with tree growth, although extreme environmental growth conditions is causing a reduced tree-ring width. On the contrary, mountain pine correlates mostly positively with spring temperature and negatively with summer temperature. Tree ring measurements confirmed higher values in beech, compared to mountain pine, with the exception of the sampling site located at 2100 m a.s.l., where beech has an average age comparable to that of the other sites, has an average diameter of 8 cm, but a mean tree ring width of 0.5 mm comparable to that of mountain pine.