

>> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

Submitted Abstract

ID IMC22-FSAbstr- 536

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Country	Slovenia
Region	Eastern Europe
Title	Land-Use And Climate Change Induced Alteration In Tree- And Forestline Location, Structure And Composition In The Eastern (Julian) Alps, Slovenia.
Keywords	Mountain Forest, Treeline, Forestline, Forest Development, Stand Structure
Type	List Of Focus Session
Focus Session ID	05

Abstract

Mountain forests in the Alps are an important natural resource enabling man to persist in this area for centuries. In the past, mountain forests even at the forest and treeline have been subjected to intensive exploitation, first by slash-and-burn techniques and grazing, and later by extensive timber exploitations, lowering tree- and forest lines and changing forests' structure and composition. Posterior socio-economic changes led to abandonment of this intensive use, first and especially in the upper-mountain elevation belt. The Alps are also significantly impacted by climate change, mainly through increased average annual temperature, the Julian Alps experiencing one of the highest increases. Additionally, mountain forests are one of the most susceptible forest types for climate induced influences.

This contribution tackles land-use and climate change induced shifts of the tree- and forest line in the strictly protected Triglav Lakes valley ($\approx 1100\text{ha}$), as well as with changes in forest cover, forest structure and composition of mountain forests in the transition zone and just under the forest line. Changes of the upper forest- and treelines were analysed by interpreting a series of aerial photographs from the mid-20th century till now. An intensive monitoring of forest ecosystems was established in 1983 to study the long-term dynamics of forest structure and composition.

Most recent analyses showed that during the last century both the upper treeline and forest line moved upwards to higher altitudes and forest cover increased. In the transition zone between forest and treeline trees and small cohorts are widely spaced, dominated by *Larix decidua* and *Picea abies*; the average stand volume was $116\text{ m}^3\text{ha}^{-1}$, thin trees up to 35 cm prevailed. Regeneration was extremely rare. Forest stands just below the forest line exhibited opened canopy closure with lots of canopy gaps, stand structure was uneven-sized and uneven-aged, stand volume was significantly higher than in the transition zone ($515\text{ m}^3\text{ha}^{-1}$), but was decreasing with increasing altitude. *Picea abies* predominated in the growing stock, regeneration was rare and occurred sporadically.

The showed dynamics of treeline and analysed alpine mountain forests may reflect combined influences of land-use change (i.e. abandoned pasture, strict protection) and climate change (i.e. increased annual temperature); forests have been gradually returning to abandoned pastures on deforested areas, occurred after the last heavy harvests in 1883. Due to slow dynamics and possible impact of climate change in mountain forests, long-term monitoring is decisive, representing an important starting point for sustainable forest management.