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## >> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

## Submitted Abstract

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First Author First Name Last Name	Dominik (1) Ambs
Submitting Author First Name Last Name	Dominik Ambs
Correspondence	dominik.ambs@tum.de
<b>Co-Authors</b> >> E-Mails will be not listed	Schmied, Gerhard (1); Zlatanov, Tzvetan (2); Brang, Peter (3); Kienlein, Sebastian (4); Nikolova, Petia (3)
Organisations	<ol> <li>Technical University of Munich, Germany</li> <li>Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences</li> <li>Forest Resources and Management, Swiss Federal Research Institute WSL</li> <li>Institute of Forest Management, Technical University of Munich</li> </ol>
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imc2022@uibk.ac.at +43 512 507 54442



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## Abstract

Mixed mountain forests consisting of Norway spruce (Picea abies (L.) Karst.), European beech (Fagus sylvatica L.) and silver fir (Abies alba Mill.) are among the most productive and stable forest ecosystems in Europe. Their south-eastern geographical distribution range extends to the Western Rhodopes where they have a high economic, recreational and ecological value. During the last two decades, shelterwood cutting has been partially replaced by single-tree and group-selection systems. However, only little is known about the dynamics of the natural regeneration in these stands and its dependency on microsite and management effects.

The objective of this study is to investigate ecological factors that influence the regeneration process in mixed mountain forests in the Bulgarian Rhodopes. We focused on (1) the density of the regeneration and its main drivers and (2) the height growth of each species in dependency of light conditions.

Data on regeneration and microsite conditions were collected in four stands located in the regional forest district of Smoljan. All stands, aged 100-150 years, were similar in climate but differed in management. In randomly selected plots, we assessed stem density of fir, spruce and beech in three height classes, recorded browsing intensity, estimated the ground vegetation cover, and quantified the solar radiation. Annual height increment during the last 3-5 years was also measured.

Across all stands, fir had the highest mean stem density (18'000 N ha-1), followed by beech (5'000 N ha-1) and spruce (2'700 N ha-1). Annual browsing was < 30 % in beech, < 10 % in fir, and negligible in spruce.

Generalized linear mixed models indicated microsite conditions and ground cover to control the development of fir recruitment, whereas light and proximity to canopy gaps were the most relevant factors for spruce and beech. Indirect light promoted height increment more strongly in beech than in fir and spruce regeneration. Potential practical implications to adapt the mixed mountain forests to a warming climate will be discussed.