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Natural disturbances and protective effect: the role of biological legacies in protection forests

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Natural disturbance regimes are expected to be greatly altered in the next future byclimatechanges (e.g.increase in frequency and intensity, changing in seasonality). Among natural disturbances, windstorms represent one of the main large-scale factor that shape European landscape and that influence European forest structure. Moreover, windstorms may affect ecosystem services that are normally provided by mountain forests such as protection against natural hazards, conservation of biodiversity or erosion mitigation. However, after a disturbance event, structural biological legacies, like deadwood, may enhance or maintain some of these ecosystem services. After a stand-replacing event, the conservation or fast restoration of all these services should be the target of post disturbance management, but currently traditional practices (mainly salvage logging) are often leading to their depletion. The study of the impact of salvage logging (i.e. the removal of almost all the biological legacies) on the protective function of mountain stands has been poorly addressed. Structural biological legacies (i.e. snags, logs, stumps) may provide protection for the natural regeneration as well as they may increase the terrain roughness, providing a shielding effect against gravitative hazards like rockfall. The aim of the present study was to investigate how biological legacies affect the multifunctionality of mountain forests, focusing on the protective function. To observe the role of biological legacies we performed software simulations of rockfall activity on windthrown areas located in the Dolomites, region highly affected by the Vaia windstorm in October 2018. Results showed the short-term important role of biological legacies in mitigating rockfall propagation, mainly as barrier effect rather than an energy reduction effect. After a natural disturbance, forest management should take into consideration the residual protective function of structural legacies. Salvage logging operations should be limited in areas where rockfall hazard is high, in order to take advantage on the multifunctionality of biological legacies during the recovery process.