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Mountain grasslands under pressure: Impacts of land use and climate changes on ecosystem services

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Mountain grasslands have been shaped by human activities over centuries, contributing to the provision of crucial ecosystem services to people living inside and outside mountain regions. However, mountain grasslands in the European Alps nowadays are facing significant transformations, mainly due to changes in the grassland management as well as climatic variations. Spatially explicit and quantitative analyses indicate that the abandonment or reduction of grazing and mowing activities generally results in lower levels of provisioning and cultural services at higher elevations. At lower elevations, the increased management intensity has focused on higher forage production, but the grassland area has been reduced due to urban sprawl or the conversion to annual or permanent cultures. Under future socio-economic scenarios, land-use changes tend to be less significant, while reforestation processes will continue to alter ecosystem services of former grassland areas in the long-term, amplifying the shift from typical grassland ecosystem services towards forest-related ecosystem services. In addition, the importance of climate change in driving changes in grassland ecosystems will increase, affecting particularly provisioning and cultural services and reducing management options. These findings emphasize the need for an adapted and more flexible management as well as for developing shared visions of appropriate and sustainable future pathways to maintain and enhance desired ecosystem services.

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