

# A systematic review of threats in permanent grassland cultural ecosystem services

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## Abstract

The degradation of ecosystems happens at an unprecedented rate, threatening the provision of ecosystem services and ultimately limiting human well-being. We conducted a systematic literature review evaluating the threats surrounding cultural ecosystem services (CES, namely recreation and landscape aesthetics) in European permanent grasslands. We classified threats into underlying causes, direct threats and consequences, and solutions that have been suggested for their mitigation. We screened 13,719 papers on their relevance, of which 77 studies in 71 articles were extracted and qualitatively analysed. We found the most common threats to be land-use and management change processes, while recreational activities also created negative feedback loops, affecting the ecosystem, biodiversity and CES themselves. Suggested solutions were most commonly socio-economic and institutional measures to improve rural populations' livelihood and improved communication with relevant stakeholders. With those tools, the continued supply of CES can be guaranteed, as they play a crucial role in reconnecting people with nature and thus ensuring future human well-being.

**Keywords:** direct drivers, Europe, nature conservation, rural development, tourism

## Introduction

In the ecosystem services literature, cultural ecosystem services (CES) have only recently become more prominent, shifting the focus from an economic-centred to a socio-ecological approach (Plieninger *et al.*, 2015). CES are defined as the non-material benefits for people and their well-being from recreational and aesthetic experience, spiritual and educational values (MEA, 2005). Through their prevailing trade-off relation with other services (Allan *et al.*, 2015), and accelerating global challenges such as the degradation of ecosystems, climate change or the COVID-19 pandemic (IPBES, 2018; 2020), CES are increasingly under pressure. For this systematic review, we evaluated the threats on recreation and landscape aesthetics in permanent grasslands described in the literature, assessing what consequences they may have and what solutions have been suggested for their mitigation.

## Materials and methods

The Scopus and CAB Abstract databases were searched on 5 November 2019 for CES in European permanent grasslands. We read 196 potentially relevant papers out of 13,719 retrieved articles and selected 71 papers that fit our scope, out of which 77 studies were extracted. A substantial part of the data analysis was the identification and classification of threats, followed by a qualitative analysis. We distinguished four levels of threat interactions, namely underlying causes, direct threats, consequences, and suggested solutions to prevent or mitigate negative effects. As threats not only impact beneficial ecosystem services but may also be caused by their usage, we differentiated between threats affecting CES (*direct threats to CES*) and threats from CES that affect grassland ecosystems and their services (*direct threats from CES*). Due to the lack of detailed descriptions of the studied grassland types in the original papers, we were unable to compare threats according to grassland types.

## Results and discussion

By far the most direct threats to CES came from land-use and management changes (e.g. abandonment, intensification, building up), the predominant driver during the second half of the 20<sup>th</sup> century (Stoate *et al.*, 2009). Underlying causes were primarily socio-economic, institutional and demographic. Another major threat was the perception of nature during recreational activities. When nature is considered as a decorative background for human activities rather than an intrinsic, alive and distinct value, it may lead to the destruction of the environment (Syrbe and Grunewald, 2017). Natural threats related to climate change were minor in our analysis, reported only six times as having adverse effects on recreation. The reduction of suitable areas for skiing and natural afforestation due to a rise in temperatures might hit the tourism industry substantially in the future (IPCC, 2014). The most widely suggested solutions were to ensure local livelihoods, preserve a healthy environment and develop a sustainable, local socio-economic system. Furthermore, CES might be the most important communication channel to raise awareness for ecosystem protection due to its close links to human well-being.

The negative impacts of CES on grasslands were predominantly driven by the high demand for recreation. Touristic activities such as hiking, skiing and vehicle use were the most mentioned threats caused by recreation, mainly affecting vegetation, soil and wildlife, but also the recreational and aesthetic quality of an area (Syrbe and Grunewald, 2017). Further pressures consisted of the development of tourist facilities (e.g. roads and ski lifts) and accommodation. Among the less-mentioned direct threats were hunting tourism and artificial snow. With increasingly snow-poor winters due to a changing climate, skiing facilities are likely to move to higher altitudes (IPCC, 2014), thus extending negative impacts into the susceptible high-Alpine zone (IPBES, 2018). Therefore, developing strategies and recognising new recreational locations for providing quality outdoor recreation will be essential (Askew and Bowker, 2018). Suggested solutions included tourism regulation and economic and regulatory tools to avoid ecosystem overuse. Further, land-use planning, the development of conservation strategies and improved communication and education were mentioned.

## Conclusions

Land-use and management change was the most dominant threat to CES, while the demand for recreation was the biggest threat from CES to the ecosystem and other services. The studies reviewed in the present study showed the need for a multi-actor approach with integrated rural development and traditional knowledge in grassland management. We further found that there are still considerable knowledge gaps regarding the effects of new challenges on CES, such as the recent COVID-19 pandemic or climate change. To date, there are only a few studies about such threats, yet climate change is expected to become a decisive future driver (IPBES, 2018). The discussed mitigation tools would guarantee the continued provision of CES and will help reconnect people with nature, thus ensuring future human well-being.

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