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Mapping habitats sensitive to overgrazing in the Swiss Northern Alps using habitat suitability modeling

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Abstract

Unsuitable livestock farming is considered as a main driver of biodiversity loss. In the high elevation areas across the world, many subalpine and alpine natural herbaceous communities are highly sensitive to sheep overgrazing. Such habitats of high biogeographic and conservation value are refugia for slow-growing, locally rare, and cold-adapted species. However, at a regional scale, no maps of these sensitive habitats exist that the authorities could refer to for regulating grazing. We therefore studied the possibility of using habitat suitability modeling (HSM) to map five selected habitats that are potentially threatened by overgrazing in the Northern Alps of the Swiss canton of Fribourg. For each habitat, we defined a group of characteristic species and gathered their occurrences from national data centers. These occurrences were pooled within each group and used as presences to calibrate the HSM. High-resolution predictors (10 m) were used to achieve fine-scale modeling. The models predicted accurate and ecologically relevant distributions for three of the habitats: alpine swards and heaths on exposed ridges and peaks, unstable calcareous screes and vegetated snow patches. These results show that habitats that are topographically and environmentally well-defined can be finely predicted by HSM using distributions of characteristic species for use in spatial conservation planning. In the context of summer pasture management, this helped us to translate the Swiss legal basis onto maps of authorized grazing pressure.