

# Effect of experimental top soil removal on vegetation of Pannonian salt steppes

## Research Article

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**Abstract:** Inland saline habitats of the Pannonian Lowland exhibit a specific variety of grasslands determined by a soil salinity gradient. Changes in the hydrological regime and absence of management have resulted in heavy degradation of the vegetation. The impact of topsoil removal on salt steppes was tested by a 3-year small-scale manipulated experiment in SW Slovakia (Kamenínske Slanisko Nature Reserve). Topsoil was removed in three contrasting types of vegetation with different soil salinities, *i.e.* in different stages of habitat degradation. Data were analysed by multi-way ANOVA and by multivariate methods. Species richness decreased and the proportion of halophytes increased significantly in the two types with the highest soil salinity; however, the total number of halophytes was not influenced by soil removal. The treatment caused inhibition of secondary succession on the plots with the highest salinity. The effect of the soil removal was only short-term in the vegetation with moderate salinity and on heavily degraded and desalinized types it even stimulated further recruitment of ruderal species. Topsoil removal has only limited potential for the restoration of Pannonian salt steppes. It should be applied only in slightly degraded vegetation, where salt accumulation is still present and target species propagules are available.

**Keywords:** *Inland halophytic vegetation • Degradation • Ecological restoration • Slovakia*

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## 1. Introduction

Grasslands of high nature value in Europe are extremely threatened by recent changes in land use as a consequence of changes in the agricultural sector [1]. An active ecological approach of restoration is required, based on scientific knowledge and taking into account economic and social constraints [2,3]. Among the grasslands requiring restoration are those of saline habitats. They belong to the most ancient lowland vegetation types of Central Europe, dating back to the middle Würm period (33,000 yr BP) [4]. The largest area of the analogous habitat type in Eurasia is known to be within the steppe zone of the Southern Ural region [5].

Pannonian saline habitats reach their northern distribution limit in Slovakia [6,7]. The vegetation in the periphery of its natural range is particularly threatened. For instance, about 8,300 ha of Pannonian

saline vegetation existed in the south-western part of Slovakia up to the middle of the 20<sup>th</sup> century [8], but after reclamation and land use changes their total area has been reduced to around 500 ha and is limited to 20 scattered locations [9].

The patrimonial value of these habitats has been recognized in Western Europe [10,11] and also in Central Europe, where the local and regional studies [12-18] document devastation of the Pannonian saline vegetation. The specific problems of the habitat degradation and fragmentation arise from drainage, river flow regulation and eutrophication, *i.e.* decrease in salinity and increase in nutrients that cause expansion of weedy species and decline of halophytes. This progressive succession has a negative impact on the survival of halophytic plant communities. Effective maintenance can be achieved by supporting the opposite, retrogressive succession [19].

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