TRANSYLVANIA DISSERTATION/THESIS PROJECT

TR92 Plant indicator species of grasslands in Transylvania

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In Europe, agricultural landscapes often possess great conservation value. The European Environment Agency (Stoate *et al*. 2009) has estimated that 50% of all species in Europe have some reliance on agricultural habitats, including species considered threatened by the IUCN (2014). This is partly due to the wide spatial extent of agricultural land in Europe, but also because of the region's long history of low intensity farming practices which have allowed species-rich farmland communities to develop gradually over time (Stoate *et al*. 2009).

The conservation value of low intensity farming areas has been recognized by European agricultural policy since the 1990s. The term 'High Nature Value farmland' (HNVf) was coined at this time to define areas where predominantly agricultural landscapes overlap with either a high diversity of habitats and species, or where these landscapes support a species of particular conservation importance, or both (Lomba *et al*. 2014). Across Europe, the maintenance of High Nature Value farmland and its important biodiversity is usually dependent on the continuation of traditional farming practices (Henle *et al*. 2008). These traditional practices are, however, in sharp decline due to drivers in recent EU agricultural policy, and this is contributing to a concordant decline in farmland biodiversity. Three key trends are typically associated with the loss of traditional farming practises: intensification of agriculture, increasing scale of agricultural operations and abandonment of agriculturally marginal but High Nature Value farmland (Henle *et al*. 2008).

The Tarnava Mare and Southern Transylvania in general, is an agricultural landscape supporting exceptionally high biodiversity, maintained by centuries of traditional small-scale farming (Mikulcak *et al*. 2013). The High Nature Value anthropogenic grasslands predominating here are of international conservation importance, representing an increasingly rare and largely intact ecosystem which has been lost in many other parts of Europe (Akeroyd & Page, 2011). Since the fall of the Communist dictatorship in 1989, this traditional farming has come under increasing threat, first from a collapse in agricultural employment and consequent rural population decline (Mikulcak *et al*. 2013), and more recently, since accession to the EU in 2007, from trends driven by EU agricultural policy (Henle *et al*. 2008).

The Tarnava Mare has some of the most species rich hay meadows and pastures in Europe, resulting from a long history of traditional low intensity farming with low fertilizer input and low stocking rates. Akeroyd& Page (2011) describe the main Tarnava Mare grassland community types and their notable species, several of which are regionally, nationally or internationally rare. As well as the importance of individual species and community types, the whole landscape's high gamma diversity, with high variation in species composition over just a few metres, is key to the region's conservation value.

Changing farming practices can facilitate habitat change, such as the encroachment of scrub onto abandoned hay meadows or reduction of grassland plant diversity as grazing intensity on pastures increases. Such changes could ultimately have an effect on botanical diversity at all levels (alpha,

beta and gamma diversity). Botanical changes can then have knock-on effects on fauna such as the invertebrate and bird species of the grasslands. It is therefore important to monitor the botanical diversity of the Tarnava Mare's grasslands to assess how changing farming practices are affecting the grassland plant species and communities. However, full botanical surveys are time consuming, requiring high levels of expertise and intensive sampling, in landscapes with high alpha, beta and gamma diversity.

Akeroyd & Bădărău (2012) have identified 30 plant species indicative of high conservation value dry grasslands in Tarnava Mare. Surveying only these 30 indicator species can potentially provide a practical and effective grassland monitoring approach. However, it is not known whether some of the indicator species are more specifically associated with the highest value meadows or pastures than others and so act as 'super indicators'. This could be judged by comparing the occurrence of each species against quality of habitat (e.g. the total number of indicator species at a site). An association analysis of indicator species is also needed to identity which species tend to occur together (and so can be considered to be replicates of each other) and which are more unique. Also, there is a need to further understand how the abundance and composition of the indicator species relate to the complete plant community of the grasslands.

Students undertaking this dissertation option will work with experienced botanists completing their annual programme of grassland botany surveys in the Tarnava Mare. Surveys are conducted at a series of at least 12 sites already identified around each of 7 villages across the Tarnava Mare Natura 2000 region in Transylvania. The survey sites have been selected to give a representative sample across the range of grassland types and levels of botanical diversity and conservation value. Each site is a 50m by 5m rectangular quadrat in which the abundance of each of the 30 indicator species is recorded. There will be the possibility of undertaking additional botanical surveys if required by the dissertation project.

Recommended Reading

Culbert, Patrick D, et al. (2017), 'Legacy effects of past land use on current biodiversity in a low-intensity farming landscape in Transylvania (Romania)', *Landsc. Ecol.*, 32 (2), 429-44.

Dorresteijn, Ine, et al. (2018), 'A new world for old landscapes: Land-use intensification and bird conservation in a traditional farming landscape', *North-West. J. Zool.*, 14 (2), 199-207.

Feurdean, Angelica, et al. (2015), 'Origin of the forest steppe and exceptional grassland diversity in Transylvania (central-eastern Europe)', *J. Biogeogr.*, 42 (5), 951-63.

Kovacs-Hostyanszki, Aniko, et al. (2016), 'Conservation of Pollinators in Traditional Agricultural Landscapes - New Challenges in Transylvania (Romania) Posed by EU Accession and Recommendations for Future Research', *PLoS One*, 11 (6),

Loos, Jacqueline, et al. (2015), 'Plant diversity in a changing agricultural landscape mosaic in Southern Transylvania (Romania)', *Agric. Ecosyst. Environ.*, 199 350-57.

Maseyk, F J F, et al. (2017), 'Effect of management on natural capital stocks underlying ecosystem service provision: a 'provider group' approach', *Biodivers. Conserv.*, 26 (14), 3289-305.

Michielsen, Mathias, et al. (2017), 'Resprouting of woody species encroaching temperate European grasslands after cutting and burning', *Appl. Veg. Sci.*, 20 (3), 388-96.

Pacurar, Florin, et al. (2014), 'Impact of Climate on Vegetation Change in a Mountain Grassland - Succession and Fluctuation', *Not. Bot. Horti Agrobot. Cluj-Na.*, 42 (2), 347-56.

Stavrescu-Bedivan, Mala-Maria, Emilia Brindusa Sandulescu, and Ionela Dobrin (2018), 'Contribution to the knowledge of Transylvanian meadow's biodiversity: short report on herbs and arthropods from Selistat (Brasov County, Romania)', *AgroLife Sci. J.*, 7 (2), 157-62.

Sutcliffe, Laura M E, et al. (2016), 'How does size and isolation affect patches of steppe-like vegetation on slumping hills in Transylvania, Romania', *Biodivers. Conserv.*, 25 (12), 2275-88.