DOI - 10.21570/BUL-201803-2

How to cure grassland ecosystems?

By Monika Janišová and Péter Török

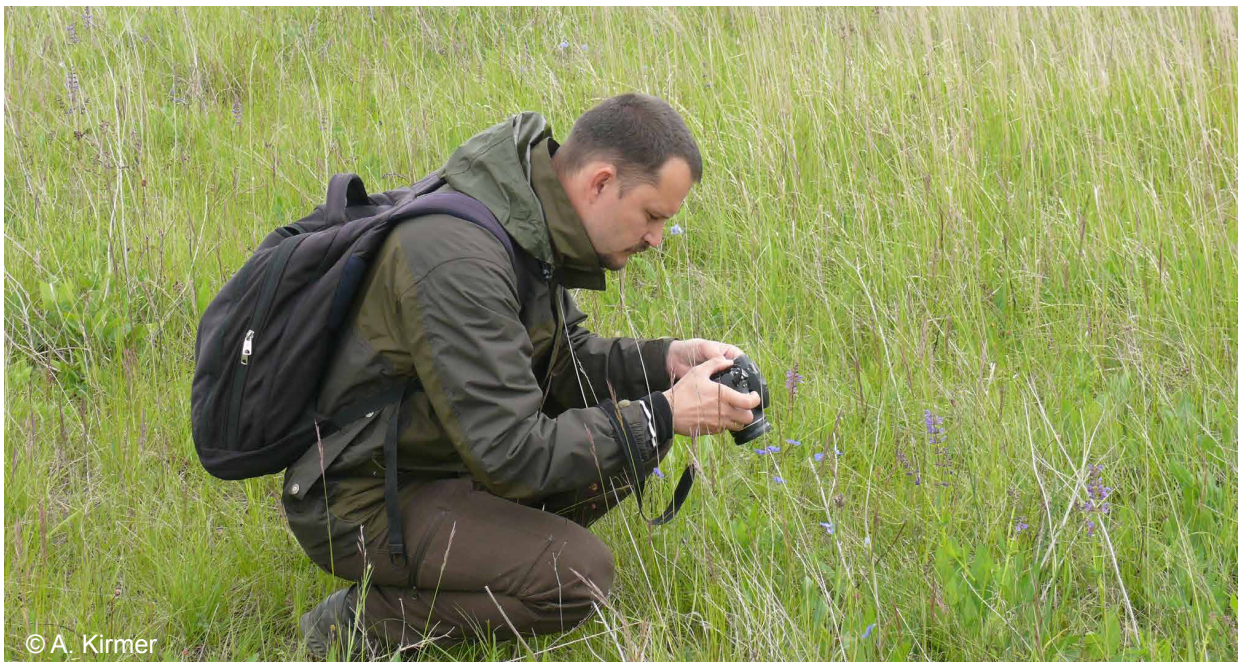
To be a restoration ecologist is like being a medical doctor. One has to cure, to heal, to repair, to recover, to restore complicated living systems for long term quality of life. Restored grasslands are partly similar to the patients, some of them in a critical state, some only slightly ill, but none of them hypochondriac. Restoration ecology is a developing scientific discipline with a profound impact on the human environment. One new restoration research team has recently been established in Debrecen, Hungary. I took the opportunity to interview the head of the team, Péter Török. Péter is also actively involved in the IAVS activities, mainly as a member of the Executive Committee of one of its working groups, the Eurasian Dry Grassland Group.

Monika Janišová (MJ): *During the last several decades, European semi-natural grasslands have changed profoundly in their quantity and quality mainly due to continuing land use changes. Grassland conservationists calling attention to the fact that the recent conservation measures of the European Union do not reach their targets, and we are witnessing the largest loss ever in grassland species and habitats. Is the situation really so critical and what values are we losing in reality?*

Péter Török (PT): It is not easy to summarise briefly the main threats and trends and to state what we lose. Very recently, the EDGG co-edited book, *Grasslands of the World: Diversity, Management and Conservation* entered the last phase of its preparation and will be published in the first half of 2018 by CRC Press (Squires et al. 2018). Together with 28 co-authors from 17 countries, we worked on 8 chapters including also an overview chapter for the whole Palaearctic. This means that about half of the whole book will deal with the current status, trends and problems of Palaearctic grasslands. One of the most important findings we were faced with during the preparation of this book is that we do not know exactly what we have. There are highly uncertain figures for total grassland area even for the EU countries; there is no unified terminology for what we mean by permanent grasslands or high nature value grasslands, and an ecologically relevant database of grasslands is also lacking. Without these, a transnational lobby for grassland conservation and restoration is on weak ground.

MJ: *Why are grassland species and habitats important for people other than biologists and agriculturists?*

PT: Grasslands are very prominent landscape elements throughout Europe. Their expansion especially in Western and Central-Europe dates back to the invention of the scythe, but in Eastern Europe, large areas of steppes already existed by that time.



Assessment of a recovered grassland by Péter Török

In a plantation producing local provenance seed for restoration in Germany (from the left to the right Sabine Tischew, Béla Tóthmérész (hiding), Péter Török, Katalin Tóth (hiding), Balázs Deák, István Kapocsi, Orsolya Valkó and Mathias Stolle)

Grasslands were deeply rooted in the religious beliefs of nomadic tribes, and large expanses of grasslands represent the endless freedom where the sky directly touches the earth at the horizon. But to be more direct, can you, for example imagine Stonehenge without being embedded in grassland?

MJ: *Why is grassland restoration interesting and why have you decided to focus on this topic?*

PT: In general, it came by chance. I wanted to be a botanist from my early childhood, I grew up near the foothills of the Alps, close to the Austrian border of Hungary. I visited the Hortobágy Puszta (where my passion towards grassland restoration developed) first time in my life when I was about 10. My first impression was that there is nothing interesting there and I made a promise to never work in such a place (OK, it was in July :), not the best time to enjoy saline habitats). But life is rather complicated :).

I was educated in secondary school as a forester, but later I decided to continue my studies in Debrecen as a biologist. First, I worked in projects related to seed banks and spontaneous succession. During my Ph.D., I was involved in the monitoring of a large-scale grassland restoration in the Hortobágy Puszta that started in 2004. It enabled me to work with a very dynamic and inspiring research team at the Department of Ecology, led by Professor Béla Tóthmérész, with Orsolya Valkó, Balázs Deák, András Kelemen and Tamás Miglécz as core members. We worked then, and also now, on various topics in grassland conservation and restoration. Later on, restoration became one of my passions :).

MJ: *Semi-natural grasslands evolved under the influence of human activities for many centuries. Can the short-term restoration activities really substantially help to keep the most important grassland values?*

PT: The brief answer is definitely no. Grasslands, both restored and ancient ones, cannot be sustained nowadays without special management mostly by low intensity mowing and/or grazing. Thus, restoration and conservation planning should also consider issues of sustainability in the long-run and the involvement of local farmers and site managers in the process. One of the key issues is the sustainable restoration and management.

MJ: *Do grassland restoration achievements survive after the restoration projects have officially ended?*

PT: We have seen many successes but the most impressive successes are seen where there is very careful planning, where local sources of diaspores are used for the grassland restoration, and where long-term management issues are also considered. A splendid example for this can be found in the White-Carpathians, where Ivana Jongepierová and

Sowing experiment using high diversity seed mixtures in the Hortobágy Puszta
(Orsolya Valkó, Péter Török and Balázs Deák)

Seed bank sampling in the early spring in the Kiskunság sandy area, Hungary
(Orsolya Valkó, András Kelemen and Péter Török)

colleagues established more than 500 ha of grasslands using high diversity seed mixtures of local provenance.

MJ: *Do all grassland habitats have the same chance to be restored?*

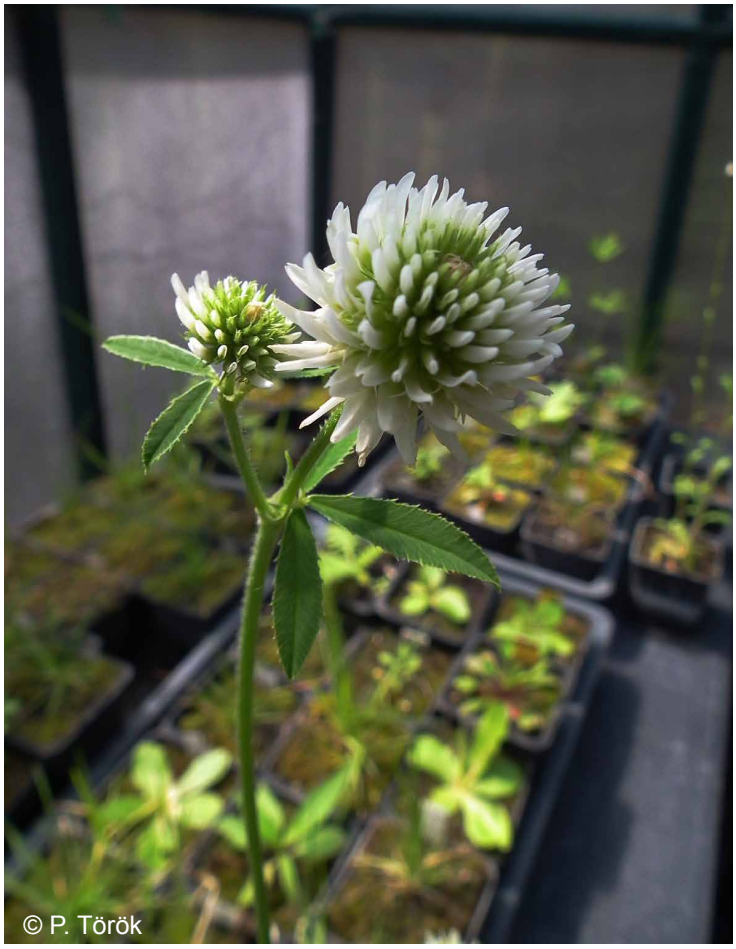
PT: I think the most difficult is the restoration of those diverse and fragmented grasslands which have either a very suitable soil for agriculture (true steppes and loess grasslands) or have nutrient poor soils characterised by species with low dispersal capacity and/or low likeliness for seed bank formation (for example stands of calcareous dry grasslands). But beyond this, the landscape context should also be carefully considered – for example, the restoration of any grassland type is difficult in a cleared landscape. Grassland restoration in general means not only the restoration of a suitable species composition of plants, but also the restoration of a dynamic system, including also pollination systems or dispersal vectors and routes. In many cases these latter are the most important facets of success.

MJ: *Restoration is an action of returning something to a former condition. In many parts of Europe, we still have high nature value grasslands preserved. I would like to know your opinion on what should be given priority in European grassland conservation – preserving the still-existing valuable grassland habitats or restoring the degraded grasslands to an acceptable state?*

PT: In my opinion, priority should be given first to stop the loss of high quality primary and secondary grasslands as they harbour significant biodiversity and are also important sources of species and restoration material for other restoration actions. This means that I would prioritise first the preservation of existing HNV grasslands. As the habitat-based conservation paradigm cannot be hold, for the effective conservation of these grasslands active restoration measures are necessary, which also consider the landscape patterns and processes. Thus, we should prioritise restoration actions that enlarge the area of HNV grasslands, create buffer zones around them and establish connections between them and connect the grassland fragments to other natural habitats. This enables us to create a functioning network of natural habitats, as stated also in plans for creating and sustaining green infrastructure.

MJ: *Could you introduce your recently established working group and the main aims you are focusing on?*

PT: With the kind support of the Hungarian Academy of Sciences' Momentum Program, we established a new research group, the MTA-DE Lendület Functional and Restoration Ecology Research Group. The research group aims to conduct functional and restoration ecological research in terrestrial and aquatic ecosystems. We are very interested in the temporal and spatial dynamics of terrestrial and aquatic communities, including succession, assembly rules, the issues of stability, spatial and temporal dispersal and establishment limitations. Of course, one of the main research objects of the research group is Palaearctic grasslands.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MJ: *How can ecological theory contribute to practical grassland restoration? Is the scientific ecological knowledge more important than the traditional ecological knowledge and experience?*

PT: I prepared a paper together with Aveliina Helm about this topic published recently in the discussion section of *Biological Conservation* (Török & Helm 2017). We summarised four crucial questions coming up frequently during practical restoration in which ecological theory can provide support. These are the following: (i) How to identify target species and baseline conditions in restoration for the selected habitat? (ii) When can one count on spontaneous dispersal and when are additional efforts required for facilitated dispersal of desired species? (iii) What determines the successful establishment and assembly of target species? (iv) What time-scale needs to be considered for the evaluation of restoration success and

Sand grassland at the Curonian spit (Lithuania)

species colonisation? One of the main conclusions was that there is a need to translate and link the current findings of theoretical ecology to restoration strategies; and to summarise the practical needs of restoration to obtain support from theoretical ecology. I think scientific ecological knowledge cannot be compared with traditional ecological knowledge and experience. Both have their role in the maintenance and recovery of biodiversity and ecosystem functions. I think that for the most effective conservation and restoration we should consider both.

MJ: *The natural ecosystem is a complex assemblage of plant and animal species in their natural environment connected by multiple interrelationships. It is difficult to imagine that a restoration ecologist can control all the relevant factors. How can the most important factors be selected to reach the particular target?*

PT: It is a difficult question, and there is no general answer. Most restoration actions focus on the recovery of target vegetation composition. Very few studies provide information on the recovery of soil biota or animal assemblages in restoration. However, several techniques facilitate the recovery of other components besides plants. For example, in grassland restoration, plant material transfer will also carry plant-dwelling insects with it, or during topsoil transfer a high proportion of the soil biota can also be transferred to the restoration site. However, these methods have strong limitations and especially the latter one seriously damages the donor site. I think restoration actions should be fine-tuned at the site level (for example in method selection) considering the site history, the type of community that should be recovered (i.e. setting a realistic target), financial and manpower requirements, availability of target communities in the landscape and local surroundings (i.e. the propagule availability in the landscape) just to mention the most crucial things.

MJ: *I suppose that restoration actions always support some organisms and supress some others. What criteria are used to select the restoration targets?*

PT: Different measures should be applied for example if we would like to restore high nature value grasslands than if the target is to restore populations of a specific gap strategist species or to facilitate the immigration of nesting birds into the restoration site. What is good for one set of species could hamper another set of species. For example, if we would like to facilitate the establishment of a temporary wetland with many open surfaces to facilitate the immigration and nesting of migratory shorebirds, then we should try to raise the water table and to apply high grazing pressure with multiple livestock types to keep the vegetation cover low. But this would definitely hamper the grassland vegetation established at the site, which we have seen for example in a restoration project at the Hortobágy National Park. In each particular case we should carefully consider all options of restoration and prioritise which restoration goals we would like to fulfil or which target we should reach, in most cases within a short timeframe granted by external proposals or funding.

MJ: *What are the main obstacles of recent grassland restorations and what solutions would you suggest?*

PT: There are many obstacles that limit both the effects and magnitude of restoration actions.I worked mostly with grassland restoration, thus, I have examples from this business, but I suppose the restoration of other type of habitats have similar problems. To cite some of these problems, first I should mention that most restoration projects are financed from external sources, e.g. from a LIFE project in which the funding is granted for a limited period of time, let's say for five years. Thus, the recovery of the restoration target is hard to reach and sustainability issues like long-term management are not considered. Second, it is necessary to maintain the reference habitats (i.e. natural or semi-natural grassland fragments in the landscape) to provide local propagule sources for restoration. The third point is that in most countries, sources of locally harvested plant material or seeds for restoration purposes are rather rare, and seeds originating from commercial sources cannot be used as they often originate from different parts of Europe or even from a different continent. I think with effective knowledge transfer and better transnational and cross-sector communication these problems can be effectively addressed.

MJ: *Thank you, Péter. Could you reveal some personal and contact data-name of your working place, working group, your study interests in general?*

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https://scholar.google.hu/citations?user=7ho2aw8AAAAJ

Just to be short with some personal facts, I'm married to Dr. Enikő Krasznai (phytoplankton ecologist) and have two kids András (4) and Dániel (2). My profession is vegetation ecology with strong emphasis on the functional ecology of grassland ecosystems, including reproductive biology, dispersal processes, biomass production and seed banks. I'm an associate professor at the University of Debrecen, Department of Ecology and as scientific advisor the leader of the MTA-DE Lendület Functional and Restoration Ecology Research Group. I also closely work together with algologists (my wife is also an algologist :)), thus the ecology of phytoplankton and benthic diatom assemblages is also not "out of scope".

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Germinating hayseed sample in the Greenhouse of the Botanical Garden of University of Debrecen