

Patterns of ecosystem vulnerability in grassland vegetation - variation in functional composition, diversity and redundancy

Diversity and composition of natural communities are known to determine ecosystem services, that is, all the goods that are provided for the society by nature. Among several aspects of diversity and composition of natural communities, functional traits of species are especially strongly linked with the fluxes of energy and stocks of nutrients in the ecosystems. It is already proven that high functional diversity is necessary for maintaining ecosystem processes and ecosystem services on a stable level, while species extinctions can lead to loss of functions and decrease in ecosystem services. The direct link between stability and extinctions is made by the phenomenon called functional redundancy. A community is more stable in terms of ecosystems functions if it contains many redundant species because functionally similar (i.e. redundant) species can substitute each other if one of them goes extinct. Therefore, in order to maintain ecosystem services at the optimal level, it is indispensable to characterise habitat types in terms of functional diversity, composition, and redundancy.

Grasslands are extremely important from the viewpoints of nature conservation, since they provide permanent or temporal habitat for many rare and protected species. They also have significant role as forage grounds for husbandry, production areas for renewable energies, recreational and aesthetical areas for the public. For the sustainable utilisation of such a multitude of ecosystem services a detailed knowledge of functional properties of grasslands is essential.

In my proposal I offer significant contributions to the understanding of functional patterns of grassland vegetation in Poland. The proposal consists of two subtopics. For both subtopics, vegetation data will be obtained from the Polish Vegetation Database. Functional traits of species will be retrieved from electronic databases (e.g. LEDA, Clo-Pla). Plant traits to be included in the analysis will be selected according to the LHS (leaf-height-seed) scheme, that is, specific leaf area, canopy height and seed mass, and will be complemented with lateral vegetative spread. These traits are known to be appropriate indicators of the life strategies of plant species.

Patterns of functional composition

This subtopic is to provide the first functional classification of vegetation in which delimitation of types is carried out by numerical classification of vegetation plots. Gradients in functional composition will also be investigated by ordination methods. As a result, grassland types will be delimited on the basis of their functional similarity, and descriptions will be provided for each type. This typology will enable scientists and stakeholders to recognise and name grassland types, which is an essential step in communicating about them.

Patterns of functional diversity and functional redundancy

Grassland types defined according to different typologies (e.g. syntaxonomy, Natura2000 habitat types) will be compared on the basis of functional diversity and functional redundancy. The expected outcomes include a characterisation and a ranking of grassland types by functional diversity and redundancy. The results should uncover how functional diversity varies among grassland types, geographical regions and areas with different environmental conditions or management history. Thus, grassland types or areas with extremely high or low functional diversity and/or redundancy could be easily highlighted. These could be significant information for scientists studying vegetation diversity and ecosystem functions of Poland. Results could provide important knowledge for stakeholders for planning long-term sustainable management of grasslands.