

Extreme climate events and biodiversity – effects of global warming on temperate grassland ecosystems

Climate change and global warming are one of the trending topics in today's public life as well as scientific efforts. Warming and extreme weather events can impact on ecosystems, coastal systems, fire regimes, food and water security, health, infrastructure and human security. One of the most fragile ecosystems to climate changes are valuable wet meadows, particularly those that are extremely rich in species. That kind of habitat is already vanishing and endangered by human activity. Not many species rich meadows survive and can be used for scientific experiments and simulation. A very unusual opportunity gives the Silesian Botanic Garden with its section devoted to habitat gardening with ca. 2 ha of translocated from the international airport Katowice vegetation plots.

The main goal of the project is to determine the reaction and direction of changes on grasslands under the influence of simulated extreme climate events. A field experiment with 12 warming open-top chambers will be established in artificial basins. The experiment will consider the impact of weather events related to climate change: extreme precipitation and increased temperatures. Intensive precipitation will be simulated by additional irrigation of patches of vegetation, while the increased temperatures through the use of open top chambers raising the temperature by ca. 1-2 degrees Celsius.

Realization of the project allow us to answer the following questions:

- 1) How do extreme weather events affect species and functional diversity of grasslands?
- 2) Can we define the functional traits that contribute the most to community resilience and resistance to extreme climatic events? What functional traits were influenced by a weather event?
- 3) Do extreme weather events affect the appearance and/or increase of abundance of expansive and invasive alien species?
- 4) Will there be a shift in species and traits composition under the influence of extreme weather conditions?
- 5) Will the changed climatic variables affect the flowering phenology? If so, how will it affect the plant-pollinator and plant-pathogen relationship?
- 6) Will the changed climatic variables affect herbivore insects and pathogenic fungi?
- 7) Does the change in habitat conditions affect microscopic fungal communities found in the air?
- 8) Can communities of fungi occurring in the air play a role of surrogate indicator of changes in species and trait diversity on wet meadows?

Global warming is a widely accepted process and its negative impact on ecosystems is beyond doubt. In recent years, a lot of manipulative experiments have been developed focusing on many different ecosystems, e.g. rainforests, tundra, alpine grasslands, semi-arid grasslands. However, little is known about the effect of species interactions, including plant-plant as well as plant-insect and plant-fungi interactions, in the context of climate change in open systems. Even basal information on specialization in species interactions is often lacking. Further research on the impacts of weather extremes associated with global warming on wet grasslands is needed, because the limited studies on ecosystems generally indicate that extreme events can have significant effects on plant community structure, growth and productivity. Some researchers even suggest that further studies should concern vegetation recovery after short periods of extreme phenomena in terms of species functional traits and functional diversity, as the mechanisms determining the response of grasslands are still unclear.