

## **DESCRIPTION FOR THE GENERAL PUBLIC**

*(State the objective of the project, describe the research to be carried out, and present reasons for choosing the research topic - max. 1 standard type-written page)*

### **A comprehensive analysis of interactions between herbaceous plants and soil microbiological and physicochemical properties in temperate deciduous forests as the basis for effective biodiversity protection of these ecosystems**

Despite a growing awareness that the herbaceous layer plays an important role in the functioning of temperate forests, it still remains neglected in the studies of these ecosystems. Herbaceous stratum represents less than 1% of forest biomass, but can contain more than 90% of forest plant species and contribute up to 20% of foliar litter. Moreover, herbaceous species have usually higher concentrations of elements such as N, P, K, and Mg in leaves than trees, and their leaves decompose more than twice as rapidly as tree litter, which facilitate efficient recycling of nutrients. These characteristics of herbaceous plant species can have profound effects on the communities of soil microorganisms in forest ecosystems. Herbaceous plants of temperate forests may also shape structure of microbial communities and soil processes because they differ in their symbiotic associations with fungi (arbuscular mycorrhiza, AM) from this of overstorey plant species (ectomycorrhiza). The studies exploring arbuscular mycorrhizal fungi (AMF) abundance and diversity in temperate forests of Europe have been rarely conducted, despite the well-recognized role of AMF in many plant communities. Complex studies on both AMF and AM formation, the structure of other microbial communities and soil processes as well as their relation to abiotic soil properties have been neglected, and such interdisciplinary research has never been carried out in temperate forests in Europe. Moreover, there is little information on how herbaceous forest plant species and their assemblages shape microbial community structure and soil processes within particular forest type. Thus, the aims of this project are to characterize and compare soil physicochemical properties, microbial community structure and soil processes under herbaceous plant species between two unmanaged forest types (beech, riparian) and also between different patches of herbaceous vegetation within particular forest. We will also answer the question whether herbaceous forest plants are dependent on AM and how AMF influence their performance, namely biomass, photosynthetic activity and the concentration of selected elements in biomass. A wide-range of modern scientific methods will be used, e.g. next generation sequencing of bacterial and fungal DNA, analysis of phospholipid fatty acids, as well as determination of soil respiration and activity of enzymes, i.e. parameters related to cycling of most important elements, namely C, N, P and S. As a result, we will obtain a comprehensive characteristics of the interactions between herbaceous forest plants and soil microorganisms in undisturbed deciduous temperate forests that may also have applications in conservation biology. We put in perspective the possible implications of microbial consortia in the active protection of forest rare plant species and in restoration of degraded forest habitats.