

Shrubs in shaping soil biodiversity in temperate pine forests

Forest biological diversity is a broad term that refers to all life forms found within forested areas and the ecological roles they perform. Forest biodiversity encompasses not just trees, but the multitude of plants, animals and microorganisms that inhabit different parts of forest ecosystems including soil. The main purpose of the research will be to determine the role of shrubs in shaping biodiversity of soil in pine forest. In the era of dynamic climate change, it is important to maintain the stability of forest ecosystems which can be increased by diversifying the composition of species. However, information on the relationship between soil nutrients, shrubs traits, and soil bacterial communities is still scarce, largely hindering our understanding of the mechanisms of shrubs-soil feedback. The proposed approach will explain the impact of above-ground and underground biomass provided by shrubs on the organic carbon accumulation and on the structure of organisms.

We will investigate the distribution of soil nutrients, soil organic matter stabilization, enzymatic activities and structure of microorganisms beneath three common shrub species (rowan (*Sorbus aucuparia*), alder buckthorn (*Frangula alnus*), European hazelnut (*Corylus avellana*)) occurring in temperate forest. The litter and root systems of selected shrub species will be analyzed in detail. The studies will cover various aspects of shrubs-soil feedbacks, including shrub effects on soil chemistry, soil organic matter stabilization, enzyme activity and composition of soil bacterial and fungal communities. Innovative research methods will be used in the research. Tree root secretions will be collected in field conditions. In addition, soil microorganisms structure studies will be conducted using molecular biology methods - Next Generation Sequencing (NGS).

Our studies will allow extending scientific knowledge by the effects of the studied shrub species on soil environment in pine forest. Knowledge about the factors shaping the biodiversity of forest soil is important for maintaining the stability of forest ecosystems. Soil biology drives and regulates key ecosystem functions in forests and that ongoing environmental change will impact soil biodiversity. Therefore, it is important to know the effect of different forest ecosystems components like shrubs on soil properties, especially soil organic matter stabilization and structure of microorganisms. No study to date has estimated the effects of the shrubs litter and roots in temperate pine forest on the amount and quality of soil organic matter fractions in connection with the microbial community structure. We hope that the better understanding of the mechanisms and factors influencing biodiversity of forest soils will allow for intentional prediction of these phenomena in the future, which will contribute to maintaining forest ecosystem stability.