We aimed to assess the impact of invasive tree species on ecosystem services of Central European temperate forests. In the project we are going to focus on the climate regulation services in macro scale, i.e. carbon and nitrogen cycling (connected with capture and storage of CO_2), as well as in micro scale (forest floor microclimate regulation). We will also focus on ecosystems ability to regeneration and invasive trees impacts on understory plants biodiversity. As a model species we choose two the most frequent invasive tree species in European woodlands: black cherry *Prunus serotina* Ehrh and black locust *Robinia pseudoacacia* L. In the project we are going to calculate carbon and nitrogen mass in forest soil, roots, leaf litter, understory, shrub layer and tree stand, as well as biomass increments and decomposition rate in 192 study plots. The plots will cover three levels of invasion (low, intermediate and high), two soil fertility levels and two stand age levels. We will also determine variability of forest floor microclimate, understory plants diversity and natural regeneration within study plots.

Invasive tree species represent one of the greatest threats to biodiversity. Despite many studies on biological invasions, only a small part of them concerns the impact of alien species on the functioning of ecosystems. Previous studies focused on assessing the impact of a given species on individual components of ecosystems (e.g. plant diversity or decomposition). Global syntheses revealed that invasive species significantly modify carbon and nitrogen cycling. Due to the fast growth rate, they accumulate atmospheric CO_2 faster, however, they also faster decompose and release CO_2 into the atmosphere. However, a few studied focused on all pools of biomass and carbon circulation in ecosystems with diverse abundant of invasive species. Therefore, our project aims to assess all components of the forest ecosystem important for carbon circulation: soil, roots, leaf litter, understory, shrub layer and tree stand. Until now, little work has covered all of these carbon pools in forest ecosystems, especially in case of root and understory biomass. Moreover, there are no works comparing the overall carbon balance in forests with different levels of biological invasions of the species studied.

Invasive species are known to have a great impact on biodiversity and microclimate. Especially trees, as keystone species, shape the environmental conditions under their canopy, having a large impact, among others for light availability, soil fertility or leaf litter quantity. In this way, they shape the amount of solar energy heating the soil, the survival rate of seedlings of particular tree species, and the species composition of the understory plants. Despite many studies, the role of invasive species in reducing species diversity is not well understood. Particularly, a little is known about invasive species impact on functional (describing species strategies of ecosystem resources acquisition) and phylogenetic (describing the evolution history of species in a particular community) diversity.

In our project, we will focus on two species with different strategies for nitrogen acquisition: *P. serotina* uptaking the nitrogen from soil, and *R. pseudoacacia* able to obtain atmospheric nitrogen from symbiotic microorganisms. Earlier studies showed that species with different nitrogen acquisition strategies represent different mechanisms and different ability to modify the environment. These species, achieving diverse ecological success, modify the environment proportionally to their biomass. On this basis, we will develop mathematical models to determine to what extent individual ecosystem services are modified by alien species. These models will use data describing forests in Poland and will allow to answer the question about the size of the change in the forests carbon storage capacity across the country under the influence of invasive species.

We assume that the results of our project will significantly increase knowledge about the impact of these tree species on the environment in a holistic aspect, and will also allow to understand the mechanisms of their impact. We expect our results to give a holistic overview of the impact of invasive tree species on carbon and nitrogen cycling in the forest ecosystems. Moreover, by determining the size of changes in ecosystem services per biomass unit, we will be able to determine the importance of biological invasions for carbon sequestration by forest ecosystems. Therefore, our results will be important for better understanding of the potential of forest ecosystems in reducing the effects of climate change.