Biological invasions are one of the most important global environmental problems related to human activity. They decrease biological diversity and cause economic losses. Plant invasions modify the functioning of ecosystems through the influence on primary productivity, decomposition of dead organic matter, element cycling and frequency of natural disturbances, for example fires. One of the most expansive alien plant species is Japanese knotweed (*Reynoutria japonica*) originating from Asia. This species produces a huge amount of biomass and sharply eliminates native plant species. There are some data suggesting that *R. japonica* also modifies soil properties and processes; however, previous studies have been focused primarily on changes in soil nitrogen turnover, for example nitrification and denitrification rates. Complex assessment of the magnitude, direction and mechanisms of soil changes brought about by *R. japonica* invasion is crucial not only for basic research, but also for practical reasons; the changes may hinder the process of habitat restoration – despite mechanical removal of the invasive plant, re-establishment of native vegetation on altered soil may be difficult.

The aims of the project are (1) linking soil physicochemical and microbial properties under *R. japonica* and native vegetation with the quantity and chemical quality of plant biomass in the field investigations (2) analysis of seasonal variability of soil properties under *R. japonica* and native vegetation in the field (3) characterization of biomass and chemical quality of *R. japonica* leaves, stems and rhizomes/roots (4) comparison of *R. japonica* growth, litter deposition and their joint effect on soil physicochemical and microbial properties, including their seasonal variability, in a pot experiment, and (5) assessment of the response of soil chemical and microbial properties to the addition of different concentrations of *R. japonica* shoot and rhizome/root extracts in a pot experiment in relation to the chemical quality of these extracts.

Plant organs (and partially extracts) will be analyzed in terms of the concentrations of elements (C, N, P, Ca, K, Mg), total phenolics, condensed tannins and selected, specific phenolic compounds, for example catechin, epicatechin, resveratrol, emodin, and myricetin. These analyses along with measurements of plant biomass produced during vegetation season will allow calculations of element and phenolic pools provided to the soil. The above-listed chemical parameters also will be analyzed in soil along with pH, element availability and particle size distribution. Biological soil analyses will include variables related to the function and structure of microbial communities, i.e., measurements of the activity of selected soil enzymes playing a role in dead organic matter decay, estimation of the ability of bacteria and fungi to degrade organic compounds (so called physiological profiles), assessment of the amount, spore production, species richness and composition of arbuscular mycorrhizal fungi with microscopic methods, and measurements of bacterial and fungal biomass using analysis of fatty acids from their membranes. The most interesting aspect of microbial studies will be the analysis of taxonomic composition of soil bacterial and fungal communities using next generation sequencing.