Description for the general public

Areas destroyed by industry must be reclaimed. Afforestation is the most common way to reclaime the post-industrial fallows. However, the post-industrial barrens are often built of infertile materials and do not contain important plant nutrients in sufficient concentrations or contain them in the forms that are not available for plants. This may restrict growth of the introduced vegetation and in consequence the functioning of ecosystems developing on the reclaimed lands. Phosphorus (P) is one of the most limiting nutrients for plant growth on the reclaimed post-industrial barrens because only a small proportion of total P is plant available. However, certain plant species are known for their ability to grow even on extremely nutrient deficient materials. These plants may transform unavailable forms of P into more available forms and in this way positively affect productivity of afforested sites. Plants capable of atmospheric N fixation (owing to symbiosis with N-fixing bacteria) may be particularly efficient in P mobilization.

The objective of the project is to assess how tree species commonly used to afforest post-industrial barrens affect availability of soil P. Studied will be two N-fixing species – black locust and black alder - and two species that do not fix atmospheric N but are well adapted to poor sites – Scots pine and silver birch. The effect of trees on soil phosphorus fractions will be assessed by measuring contents of P released by various extractants differing in their extraction power. Activity of soil enzymes involved in phosphorus transformations (phosphatases) and microbial P will be determined as well in order to check the role of soil microorganisms in P transformations in the reclaimed soils. The measured soil P fractions will be compared to P contents in leaves and needles of the studied trees in order to assess availability of P in these fractions.

We presume that the N-fixing species and those that do not fix atmospheric N will differ in their effect on availability of soil P. However, we are not sure which group of plants will be more efficient in increasing P availability as the scientific reports are inconsistent in this respect. The studies will be carried out on the post-industrial sites that are built of materials that are difficult to reclaim such as combustion wastes are extremely poor sands. Such areas will be created by human activity also in the future so it is necessary to develop efficient methods of their reclamation.

The influence of major plant species used in reclamation of post-industrial barrens on the availability of phosphorus in the young post-industrial soils (technosols) will be recognized. Thus, the project will contribute to the development of innovative, cost-effective methods of forest management on inhospitable sites such as post-industrial barrens.