SPATIAL VARIATION OF STRUCTURE PROPERTIES IN SOILS OF MORAINE UPLANDS TRANSFORMED BY ANTHROPOGENIC DENUDATION ON THE EXAMPLE OF CHEŁMNO LAKE DISTRICT

Hanna Radziuk

Problem of rational soil management reflects trends in the agricultural policy of the European Union. The widespread understanding of the role of soil in the functioning of landscapes causes special attention to the protection of its natural properties and the identification of existing threats. The systemic requirement to protect soils as the most important component of the landscape leads to further emphasizing of the specific role of soil structure as a property that has a significant impact on most of the processes occurring in soils.

Soil structure is a key factor affecting the susceptibility of soils on erosion. Soil structure studies, although numerous, often ignore spatial issues and do not allow to reconstruct a detailed picture of structure transformations in areas with heterogeneous soil cover. In addition, studies of soil structures focus on a range of soil environments. Moreover, the use of non-uniform research methodologies at different stages does not allow to compare of results and create of satisfying maps of spatial variation in structure properties. The aim of the study was to determine the variation of soil structure properties in young hummocky moraine uplands exposed to anthropogenic denudation, and to visualize this variation using current cartographic tools and GIS software. The result of the research became a comprehensive assessment of the water resistance of the soil structure. The assessment was based on the results of field and laboratory experiments, and it confirmed the basic hypothesis that anthropogenic denudation largely influences the variability of structure in eroded and non-eroded pedons. In the soils transformed by anthropogenic denudation, the quality of the structure and its resistance to water impact varies depending on the basic properties of the soils linked to slope processes. In each group of soils associated with a different type/degree of anthropogenic denudation, different factors are leading. That determines the behaviour of soil aggregates during their contact with water. In Eutric Regosols it is the content of secondary carbonates, and in Haplic Luvisols is the content of clay particles. Both factors have a negative effect and significantly increase the susceptibility of these soils to erosion. In non-eroded Luvisols and Phaeozems and Mollic Gleysols, the most important factor is the soil organic carbon content. Further stages of soil transformation - from non-eroded to completely eroded - lead to increasingly strong susceptibility to erosion. However, it should be emphasized that the lack of differences between Eutric Regosols and Haplic Luvisols in potential erosivity indicates an increased risk of erosion already at the time of incorporation of the Bt horizon into the arable layer. Further denudation leading to shallowing of the Ck parent material no longer causes an acceleration of erosivity. At the same time, in the subsoils of all pedons apart from the Phaeozems, the water resistance of the structure to erosion is very poor. Ploughing depth in areas with transformed soil cover in a direction of shallowing soil profiles can significantly reduce the water resistance of the surface layer’s structure and cause an acceleration of erosion.