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Bioindication in Urban Soils in Switzerland

J. Amossé (1,2), C. Le Bayon (1), E.A.D. Mitchell (2), and J.M. Gobat (1)

(1) University of Neuchâtel, Laboratory Soil and Vegetation, Neuchâtel, Switzerland, (2) University of Neuchâtel, Laboratory of Soil Biology, Neuchâtel, Switzerland

Urban development leads to profound changes in ecosystem structure (e.g. biodiversity) and functioning (e.g. ecosystem services). While above-ground diversity is reasonably well studied much less is known about soil diversity, soil processes and more generally soil health in urban settings. Soil invertebrates are key actors of soil processes at different spatial and temporal scales and provide essential ecosystem services. These functions may be even more vital in stressed environments such as urban ecosystems.

Despite the general recognition of the importance of soil organisms in ecosystems, soil trophic food webs are still poorly known and this is especially the case in urban settings. As urban soils are characterised by high fragmentation and stress (e.g. drought, pollution) the structure and functioning of soil communities is likely to be markedly different from that of natural soils. It is for example unclear if earthworms, whose roles in organic matter transformation and soil structuration is well documented in natural and semi-natural soils, are also widespread and active in urban soils.

Bioindication is a powerful tool to assess the quality of the environment. It is complementary to classical physicochemical soil analysis or can be used as sole diagnostic tool in cases where these analyses cannot be performed. However little is known about the potential use of bioindicators in urban settings and especially it is unclear if methods developped in agriculture can be applied to urban soils. The development of reliable methods for assessing the quality of urban soils has been identified as a priority for policy making and urban management in Switzerland, a high-urbanized country.

We therefore initiated a research project (Bioindication in Urban Soil - BUS). The project is organised around four parts: (i) typology of urban soils in a study Region (Neuchâtel), (ii) sampling of soil fauna and analysis of soil physicochemical properties, (iii) comparison of the functionality of urban soils and alluvial soils, used as a natural reference because of their regular physical perturbation by flooding and associated erosion/sedimentation, (iv) evaluation of soil bioindicators (e.g. earthworm, enchytraeid and testate amoebae) for urban soils. The application objective of my research is to introduce bioindicators and their limit values for the future revision of the legal Ordonnance on soils (OSol), and to develop guidelines to improve or to build urban soils with the aim of reaching a sustainable urban ecosystem development.