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Various approaches to study soil degradation in a region strongly affected by acid deposition

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This contribution is focused on the Jizera Mountains as a region strongly influenced by man in past. Structure of natural forest was changed. Age and species monocultures were planted. High acidificants concentrations in atmosphere led to decline of these monoculture forests in the top parts of the mountains and high acidificants deposition damaged the soils in whole region. Degradation level assessment of these soils by various ways is the aim of this study. Soil samples were collected from soil pits in surviving nature-close beech forest and in production spruce forest, and also in area with dead forest with grass cover of soil. Soil samples from sufficiently deep diagnostic horizons were taken to study chemical properties. Basic soil characteristics were measured by commonly used methods (pH, effective cation exchange capacity - eCEC, A400/A600 as humus quality parameter, contents of available Ca, Mg, K and P, pseudototal content of Ca and Mg, and two differently extracted potentially toxic Al forms). Soils of the Jizera Mts. are strongly acid with low eCEC. It is result of natural and anthropogenic acidification process. The differences between nature-close, production and dead forest are localized mainly in surface soil horizons. Soil properties of deeper horizons are very similar. Nature-close forest soils represent better conditions as higher pH, higher nutrients content and lower potentially toxic Al forms content than spruce monocultures. Also grass cover in dead forest slightly improves soil conditions in contrast to foregoing production spruce forest. From this point of view the degradation by acidification mainly threatens soils in coniferous production forest. Natural systems have higher resilience and natural mechanisms are able to slightly mitigate soil degradation. The substances mobility in the soil profile and their possible occurrence in surface and subsurface water is controlled by water regime in the soil profile. Undisturbed soil samples were taken from diagnostic horizons to

study soil hydraulic properties using multi-step outflow method. In addition, micromorphological properties characterizing soil porous structure were also studied on soil thin sections prepared from the large soil aggregates. Despite varying thickness of soil horizons, the soil hydraulic properties were similar in different forests. In contrast, the soil hydraulic properties of soil horizons under the grass cover showed higher retention ability. However, soil hydraulic properties are also affected by position of studied locations (elevation, surface slope, exposition, and so on). Higher retention ability causes lower water and dissolved substances outflow at the bottom of the soil profile and, as a result, lower degree of soil depletion and water pollution.

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