

ABSTRACT

This Ph.D. thesis gives a study of distribution and mobility of heavy metals in small urban streams affected by urban drainage. Urban streams receive the discharge of overflows from the combined sewer system, which often causes changes in hydrological, physical and chemical conditions in stream. Such changes can induce redistribution and remobilization of heavy metals associated with the sediment.

The theoretical part of the thesis characterizes heavy metals as specific pollutants, describes processes and factors which can influence their mobility and distribution in aquatic environment. Furthermore it demonstrates an important role of sediments in heavy metal accumulation and briefly summarizes current legislation regulations regarding sediment management.

Next chapter describes a system of urban drainage in Prague, three urban streams in Prague - Botič, Rokytka and Kunratický stream, which were chosen as experimental catchments in respect to objectives of thesis and then natural conditions in their drainage area.

With regard to accuracy, simplicity and laboratory equipment accessibility the methodology is compiled on the basis of current laboratory and analytical methods assay.

Water quality is assessed and compared based on own and adopted monitoring in 2004-2005. Major industrial wastewater producers which affect water quality in Botič and Rokytka by the discharge of overflows from the combined sewer system are identified.

Distribution of heavy metals in sediment is investigated by sequential extraction procedure and geochemical analysis. Consequently, ecotoxicological risk and heavy metal potential mobility is assessed.

The heavy metal concentrations and ecotoxicological risk in sediment at downstream profiles of Botič and Rokytka show significant increase caused by urban drainage. Changes in distribution of Cu and Zn to easily available fractions below overflows from the combined sewer system were observed in Botič. The heavy metal concentrations in sediment of Kunratický stream have no significant trend in longitudinal profile, however high concentrations of cadmium were measured in sediments nearby Šeberák pond.

The multivariate analysis shows itself to be very useful tool for classification of pollution levels and identification of urban drainage impact. In case of rain the combined sewer system significantly deteriorates water and sediment quality and it may cause the change in distribution of heavy metals to easily available fractions.