Predicting zones and potential sampling methods for elevated metal concentrations in urban soils, Halifax, Nova Scotia, Canada

FIONA H. M. HENDERSON* AND ANNE MARIE RYAN

Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 4R2

Canada lacks a uniform method for sampling metals in soils, posing challenges for comparing studies and hindering the recognition of trends. Although problematic, the absence of a standard methodology is not unfounded. The extensive variability of soil properties throughout time and space makes it difficult to evaluate a study area. This is particularly the case in urban areas, where soils may have been disturbed and soil horizons are not well developed. Developing a standard methodology thus holds substantial significance, both in soil science and for society. Methods designed to be used ubiquitously not only allow studies to be comparable, but may add to the effectiveness of environmental and health risk assessments. This study focuses on developing a protocol for predicting and potentially mitigating elevated metals in city soils within Halifax, Nova Scotia. One aspect of the study aims to predict where high metal concentrations may arise in a city, by identifying past land use activities that are strongly associated with a particular metal(s). Prediction methods include the creation of a Geographic Information System (GIS) map, which illustrates potential zones of high metal concentration. Another aspect of the study involves developing a consistent sampling protocol for urban soils, using samples from within the city of Halifax. A total of 50 depth-based samples will be obtained from various locations. At each site there will be a collection of 0–5 cm and 0–15 cm sample depths, which will be evaluated through X-ray fluorescence (XRF) analysis. Of these samples, those that have metal concentrations close to or above provincial and federal guidelines will be sieved to particle sizes of 1 and 2 mm. Comparison of metal concentrations relative to particle size and sample depth will potentially add to the identification of patterns. Pending results of soil sample analysis, remediation efforts may be explored by evaluating dilution effects on soils with elevated metal content, using mass balance considerations. Conclusions drawn from analysis will aid in the refinement of useful sampling methodologies. The intent of this study is to build a foundation for determining the 'best practice' for assessing elevated metal concentrations in city soils.

**Winner of the Atlantic Geoscience Society Award for the best Environmental Science presentation*

Atlantic Geology, 2016, Volume 52
Atlantic Universities Geoscience Conference 2016 – 66th Annual Conference, October 27-29, 2016
doi: 10.4138/atlgeol.2016.012