

7. Application of U.S. Soil Survey Geochemical Characterization Data to Urban Areas

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Abstract:

The National Cooperative Soil Survey (NCSS) program is responsible for mapping all soils in the United States. The initial mapping of non-federal land is nearing completion. There is a new focus on updating our soil surveys, including soil surveys in urban areas. This particular focus on urban soils has seen increasing emphasis as urbanization is expanding at a rapid rate in the U.S. and worldwide. Natural geographic patterns of soils on landscapes are altered via man-made disturbance, often with the addition or deletion of organic or inorganic constituents. Thus, these soils do not have the concentration and distribution of soil components that necessarily comply with the traditional soil-landscape paradigm. Soil characterization, including geochemistry, is useful to examine urban soils for determination of both native properties and anthropogenic history to help define the range of characteristics and evaluate potentials and/or limitations of the soil for land use. The objective of this presentation is to evaluate the role of geochemical analysis in helping to define soil components, understand the pedological history of the soil, and develop interpretive guidelines for soils in urban areas within the context of the soil survey.

Soil survey information is useful for general planning activities and as such, this information is not adequate for site-specific interpretations because of scale of mapping, low sampling density, as well as insufficient knowledge about the actual impact to soil health of potentially elevated levels of trace elements at a particular site. Yet, soil scientists have an understanding of chemical and physical properties and processes in soils, and this knowledge is important for interpreting field and laboratory data and educating the public on uses of urban soils. The degree of geochemical alteration of native soil material may be an important indicator of soil-related problems that impact land use applications such as development for home sites, playgrounds, and gardens. Anthropogenic alteration may be identified by the presence of human-transported soil material derived from an external source, by on-site contamination of native soil material, or by exposure of in-situ substrata as the result of excavation. The resulting chemical signature of a soil can help determine the source and degree of this alteration that may exist in an area. Field evaluation of multiple sites is critical prior to selecting representative locations for soil characterization that would be useful developing proper interpretations from the resulting data. Geochemical information from urban soils can be evaluated for possible anthropogenically-modified levels of trace elements through comparison of data from similar soils that have natural (i.e. background) elemental concentrations. Establishing appropriate background values is important for determining extent of anthropogenic impact and development of a remediation plan. Knowledge of elemental variability of map unit components at the scale of mapping should also be considered. These requirements may be met with site selection techniques such as sampling additional pedons that are paired across identical landforms or that are grouped around a principal pedon site (i.e. satellite samples). Comparison of data from surface to subsoil horizons within the same pedon may also provide an understanding of anthropogenic alteration.

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