Don't overlook urban soil

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If you were looking for fertile soil, it's doubtful you'd begin your search in most U.S. cities. After all, urban soils are often viewed as drastically disturbed soils with low fertility. However, new research by a team of scientists working in Baltimore discovered that surface soil characteristics were not necessarily infertile and varied widely, making it difficult to define or describe a "typical urban soil."

Although the more conspicuous effects of urban disturbances on soil have been considered by researchers, other factors associated with urban land transformations have received limited attention. These various effects create a "mosaic" of soil conditions, ranging from natural to highly disturbed soil profiles.

To examine the effects of land use and cover on soils, researchers from USDA Forest Service and the University of Maryland Baltimore County sampled and measured the physical and chemical properties of surface soils from 122 Baltimore plots. Researchers report their findings in the May-June 2007 issue of *Soil Science Society of America Journal*.

This research was part of the Baltimore Ecosystem Study (BES), an ongoing effort to understand urban ecosystems, which is funded by the National Science Foundation.

According to the authors of the study, "Land use and cover may serve as an indicator of disturbance, site history, management, and the urban environment." By measuring the chemical and physical differences among various soil plots, scientists hoped to determine whether land use

or cover was the cause of differences and what specific soil properties best differentiate the land-use and cover types.

Chemical analysis of Baltimore's soils revealed high chemical variability, while physical measurements of soil were less variable.

"In general, levels of essential nutrients in Baltimore's soils were adequate for plant growth, but in some cases calcium levels were excessive, making those soils more alkaline," said Richard Pouyat, US Forest Service researcher and lead author of study. "The high calcium levels are probably related to the presence in urban environments of calcium-rich structural materials such as concrete."

Additional analysis revealed that forests and cover types dominated by turfgrass showed differences in potassium and phosphorus levels and in bulk density, most likely due to fertilization and trampling that is typically associated with turf areas. Researchers also discovered differences in soil pH between residences and other land uses dominated by turgrass, such as transportation and commercial corridors. Scientists believe these differences may reflect variations in management and proximity to calcium-rich building and paving materials.

Contrary to their predictions, researchers discovered no relationships found between land use and heavy metal levels. Rather, researchers found trace metals to be correlated with surface rock types instead of urban factors, making these characteristics unique to the Baltimore region.

"This was surprising since in an old industrial city like Baltimore, [where] large volumes of soil were disturbed, added, or removed over time and have been exposed to various contaminants," said Pouyat. The strong relationship between surface rock types and trace metals suggests that the transport of soil within the Baltimore landscape occurred at short

distances.

Researchers hope the soil properties revealed by the Baltimore study will be helpful in conducting future urban soil surveys.

“Since some of the properties measured are related to human activities that typically occur in urban landscapes, comparable studies in other cities should show similar results,” said Pouyat.

Future studies by the team of scientists will investigate the relationships of soil heavy metals with other urban factors.

Source: Soil Science Society of America