

Physical & social impacts on hydrologic properties of suburban soils

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Abstract:

Land development practices result in compacted soils that filter less water, increase surface runoff and decrease groundwater infiltration. However, until now, there has been relatively little study of how hydrologic properties of lawns differ according to residential character. This study examines how soil infiltration rates and water retention properties of residential lawns differ according to social and physical factors that are readily attainable from national data sources. We find that saturated infiltration rates in residential lawns differ from those in comparable forest soils. These differences cause increases in overland flow under wet conditions or large storm events from residential catchments and subsequently greater runoff than accounted for in hydrologic models. Intra-parcel differences in bulk density and soil depth indicate that runoff from residential lawns is more likely from the near-house and near-curb areas while the middle of the front yard and backyards will be less likely to saturate. Variation in residential lawn soil properties, such as mean pore size, can be explained by social factors including house value, year of development, parcel size and physical factors including catenary effects and coarse vegetation per parcel. Older residences have higher infiltration rates, but the low infiltration rates of new lawns appear to be mediated by the preservation of forest cover at the site. We are actively exploring the extent to which land use legacy attributes to this effect. These results hold implications for obtaining more accurate hydrologic parameters for urban storm water modeling, the types of neighborhoods (newer and with low-tree cover) that should be targeted for best management practices, and the effectiveness of tree preservation as low impact development.

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