

14. Effects of land use and vegetation cover on soil temperature in urban ecosystem

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Abstract:

Conversion of native ecosystems to urban and agricultural lands has increased air and soil temperature that influence soil carbon and nitrogen cycling. Models of changes in soil temperature often do not account for urban land-use change, and thus fail to produce accurate predictions at high-resolution spatial and temporal scales. We used measurements of average daily soil temperature at 10-cm depth at urban and rural forest and grassland sites over 8 years in the Baltimore metropolitan area and developed a model of the average daily soil temperature that accounts for two vegetation and two land-use types. Average annual soil temperature was higher in urban than rural sites under both turfgrass (15.0oC versus 13.5oC) and forest (12.6oC versus 12.2oC). Application of climate change scenarios predicted by general circulation models (GCMs) to the developed model suggested that the highest increases in mean monthly soil temperature will range from 1.2 to 2.0 oC while the air temperature is projected to change from 3.4 to 5.6 oC between 2070 and 2099 depending upon GCM. The model can be used for predicting the average daily soil temperature in the Baltimore area.

Keywords: Land use, vegetation cover, soil temperature, urban heat island, mixed-effects model

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