Urban Heat Islands

Project(s): Maximizing ecosystem benefits of urban trees by determining sustainable soil volume requirements (Bassuk; 2012 – 2015).

Researcher: Nina Bassuk

Need: Urban environments can be up to 20°F warmer than the surrounding rural countryside, resulting in increased energy demand for cooling as well as higher incidences of heat-related illnesses. Known as “urban heat islands,” asphalt parking lots and roads store heat and re-radiate it during cooler parts of the day. Buildings prevent heat dissipation and impede airflow. Increasing vegetation cover helps to mitigate these effects by reducing temperatures in surrounding areas. Research is needed to determine the minimum volume of accessible soil for successful establishment and sustained growth of trees in the urban environment.

Approach: Using Ground Penetrating Radar, Bassuk and her team surveyed root systems of common trees (e.g., red maple, Accolade™ elm, goldenrain tree, and chinkapin oak) and related them to standard tree measurements. Radar provided a window into the extent of roots growing in several common urban planting conditions, including open lawns, tree lawns, standard tree pits surrounded by sidewalks, and traditional and porous parking lots. With updates to the oft-cited Lindsey/Bassuk model (1991), they calculated soil volume requirements for the 38 study trees and transformed their results into a soil volume calculator tool for stakeholders.

Results and Impact: The effectiveness of efforts to implement large-scale urban planting programs depends on meeting sustainable soil volume requirements. Bassuk and her colleagues found that trunk diameter was a strong indicator of rooting volume, thus identifying a proxy for the more expensive Ground Penetrating Radar. Additionally, statistical improvements to their previous soil volume model represent a substantial advance in urban forestry, which the team worked hard to communicate. Through academic courses and Cornell Cooperative Extension training programs, methods for calculating adequate space for trees were taught to students, master gardeners, landscape architects, and urban foresters. With education and outreach, including future improvements to their interactive soil volume calculator, Bassuk’s hope is that trees will be given priority consideration in urban landscape design, and their mitigating effects on urban heat islands will be more fully realized.

Relate Information: Urban Horticulture Institute