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Spatial variability of soil and vegetation characteristics in an urban park in Tel-Aviv

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Mosaic-like spatial patterns, consisting of divers soil microenvironments, characterize the landscapes of many urban parks. These microenvironments may differ in their pedological, hydrological and floral characteristics, and they play important roles in urban ecogeomorphic system functioning.
In and around a park covering 50 ha in Tel Aviv, Israel, soil properties and herbaceous vegetation were measured in eight types of microenvironments. Six microenvironments were within the park: area under Ceratonia siliqua (Cs-U), area under Ficus sycomorus (Fi-U), a rest area under F. sycomorus (Re-U), an open area with bare soil (Oa-S), an open area with biological crusts (Oa-C), and an open area with herbaceous vegetation (Oa-V). Outside the park were two control microenvironments, located, respectively, on a flat area (Co-P) and an inclined open area (Co-S). The soil was sampled from two depths (0-2 and 5-10 cm), during the peak of the growing season (March). For each soil sample, moisture content, organic matter content, CaCO3 content, texture, pH, electrical conductivity, and soluble ions contents were determined in 1:1 water extraction. In addition, prior to the soil sampling, vegetation cover, number of species, and species diversity of herbaceous vegetation were measured. The barbecue fires and visitors in each of the microenvironments were counted.
Whereas the soil organic matter and vegetation in Fi-U differed from those in the control(Co-P, Co-S), those in Oa-V were similar to those in the control. Fi-U was characterized by higher values of soil moisture, organic matter, penetration depth, and vegetation cover than Cs-U. Open microenvironments within the park (Oa-S, Oa-C, Oa-V) showed lower values of soil penetration than the control microenvironments. In Oa-V unique types of plants such as Capsella bursa-pastoris and Anagallis arvensis, which did not appear in the control microenvironments, were found. This was true also for Fi-U, in which species like Oxalis pes-caprae were found. Significant differences in soil and vegetation properties were found between Re-U and the rest of microenvironments.
Differences in levels of human activities, in addition to differences in vegetation types, increased the spatial heterogeneity of soil properties. The rest microenvironment (Re-U) exhibited degraded soil conditions and can be regarded as forming the fragile areas of the park.
An urban park offers potential for presence and growth of natural vegetation and, therefore, also for preservation of biodiversity. Natural vegetation, in its role as a part of the urban park, enriches the landscape diversity and thereby may contribute to the enjoyment of the visitors in the park.