



Ancient settlements are significant sources of nutrients in Eastern Mediterranean ecosystems - the case of Tel Burna, Israel

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Past human settlement activities have caused changes in soil chemical properties that may persist in the cultural soil archive for a very long time and some of them are practically irreversible. We are studying the question if the large-scale mapping of elemental composition based on the surface layer of contemporary soil can reveal spatial patterns corresponding to areas of settlements, which were abandoned even millennia ago.

Our case-study is focused on the archaeological site of Tel Burna, located in the Shephelah region, Israel, and its immediate surroundings, making a survey area of 68 ha. The site is known as the town flourishing mainly in the Late Bronze Age and Iron Age (13th-7th centuries BCE). The heyday of the town was during the 10th – 8th centuries BCE, when its summit was enclosed by a massive limestone wall. Later on the significance of the settlement declined, and the architecture vanished. The place has gradually turned to an uninhabited area, used in the recent period as a pasture. We have measured the chemical composition of 350 samples from the surface soil at and around the site by a portable XRF device as part of an on-going interdisciplinary research project studying this site. The results were analysed by standard statistical methods and also in geographical information systems, which were used for calculating models of elemental distribution patterns across the surveyed area.

In this paper we discuss the observation that the anthropogenic impact on the chemical composition of soils became quite significant already in times of ancient societies. This human-induced signature was of such magnitude that it can still be detected today, not only in the sub-surface archaeological deposits, but also on the very surface of the present-day landscape. We are able to demonstrate that the nutrients accumulated within the precincts of ancient settlements through the intensive deposition of organic and inorganic waste have been slowly released into local ecosystems and this process of nutrients dispersion will continue in the future. Human activities certainly have (and always have had) a long-term effect on soils, but not all these impacts are negative in the sense of environmental pollution. Especially in the semi-arid Mediterranean ecosystems, where some key nutrients like P, K, S, Zn, Cu may be deficient in contemporary soils, the immediate surroundings of archaeological sites are clearly enriched from local reservoirs of such elements represented by archaeological sites. This demonstrates that archaeological sites are not only important cultural heritage, but also an essential part of local ecosystems, playing significant yet under-studied role in their long-term sustainability.