

Soil criteria for applied landscape assessment in the Mediterranean region (the Northwestern Negev, Israel)

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Method

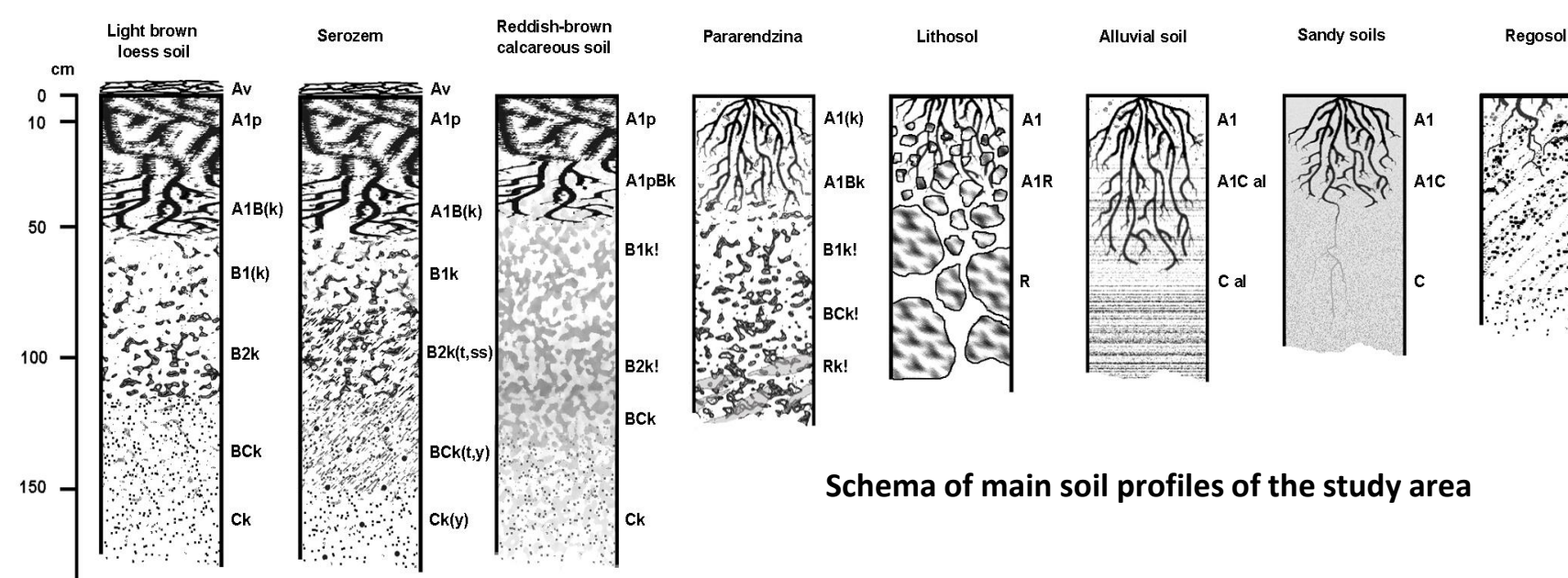
The modern intensive sustainable crop production is possible only on the basis of information about properties of soil profiles and forms of their spatial patterns. Depending on the methods of analysis, three groups of soil properties are distinguished and compared. Firstly, the properties fixed by a particular field morphological description of soil profiles; secondly, the readings of soil samples provided by laboratory analysis; and thirdly, the spatial traits of soils, which are determined by the landscape spatial heterogeneity. Generally, such a pedologic approach is closely tied with landform mapping and integration of different non-soil environmental attributes. In the agricultural regions with natural vegetation highly imposed by human activity, a geomorphologic and lithological composition of the territory plays a crucial role in proper soil units delineation.

Mapping of soil properties that limit plant growth enables assessment of the landscape suitability for agricultural use. This assessment is especially important for irrigated crops. In Israel, the intermediate scale (1:100,000 to 1:200,000) is better suited for assessing the landscape at a regional level. This regional level of mapping allows the main features of soils that interfere with agricultural enterprises in the region to be determined, and orients them towards the development of a proper programme of territorial usage. Additionally, it allows proper soil mapping to be addressed at local level and creates the basis for transition to a national level of applied soil properties analysis.

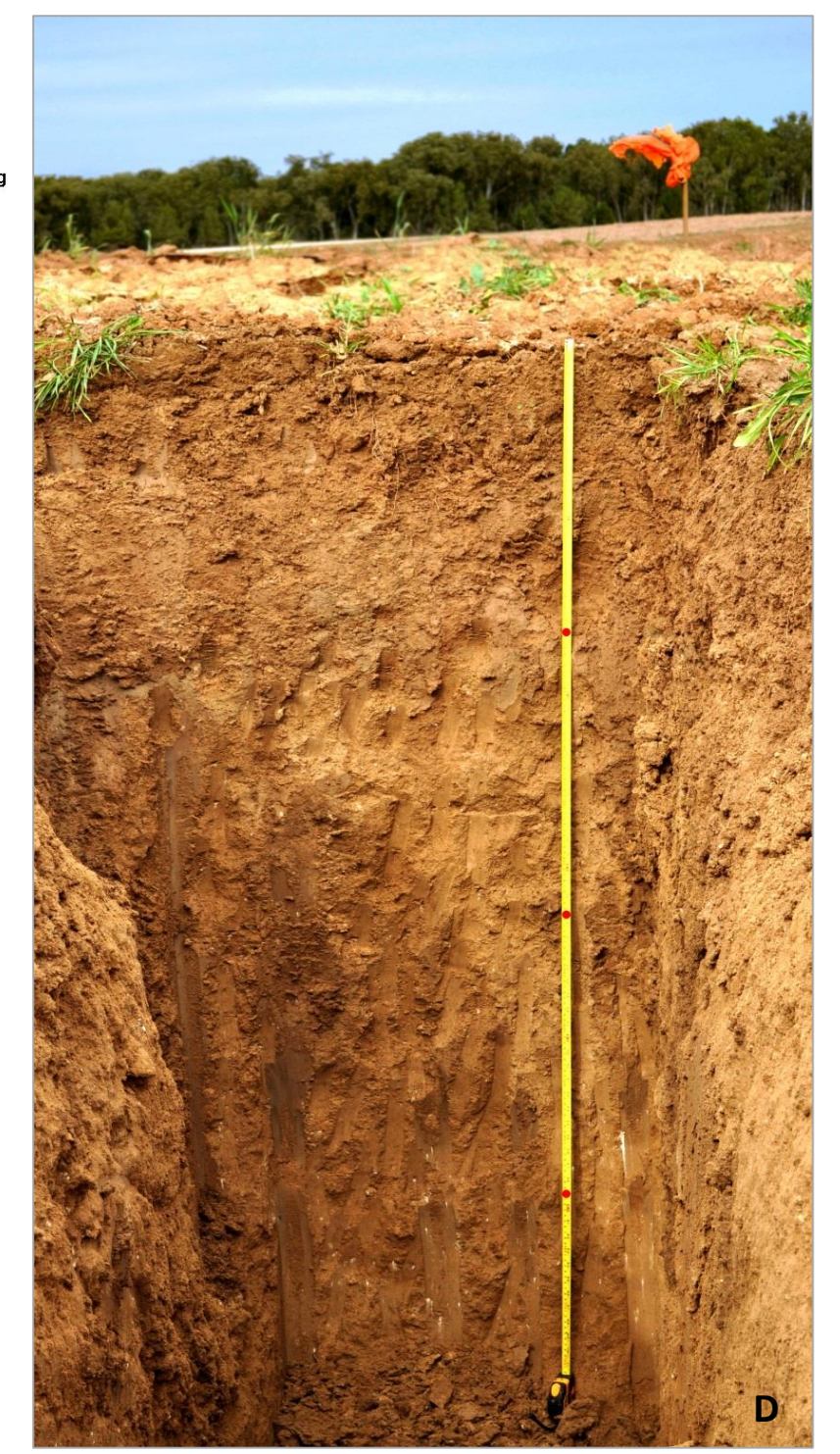


Landscape description

The Northwestern Negev is an arid and semi-arid region with an average annual rainfall of 200 to 400 mm. It can be divided into three main geomorphological regions. The eastern region is represented by low smooth hills composed of conglomerates and outcrops of carbonate rocks with stony shallow lithosols. The central region is occupied by the ancient alluvial loess plain. A southern segment is covered by sand sediments, while the central and northern segments consist of loess with light brown soils and sometimes serozems. In the west coastal region there are ancient dunes, composed of carbonate sandstone with a complex of specific soils among which Pararendzinas and reddish-brown calcareous soils dominate. Currently, the Northwestern Negev area is characterized by intensive agricultural land use with many irrigated field crops and plantations, as well as numerous greenhouses. Sites unsuitable for farming are afforested mainly by different species of pines and eucalyptus. Several large ephemeral streams with alluvial soils dissect the territory in an east-west direction, where the valleys of Gerar and Besor streams are largest. Inside the valleys, badlands are common, where regosols are usually found. These areas are recognised as tourist attractions because of their recreational value which are also associated with existence of numerous cultural heritage sites of different periods.

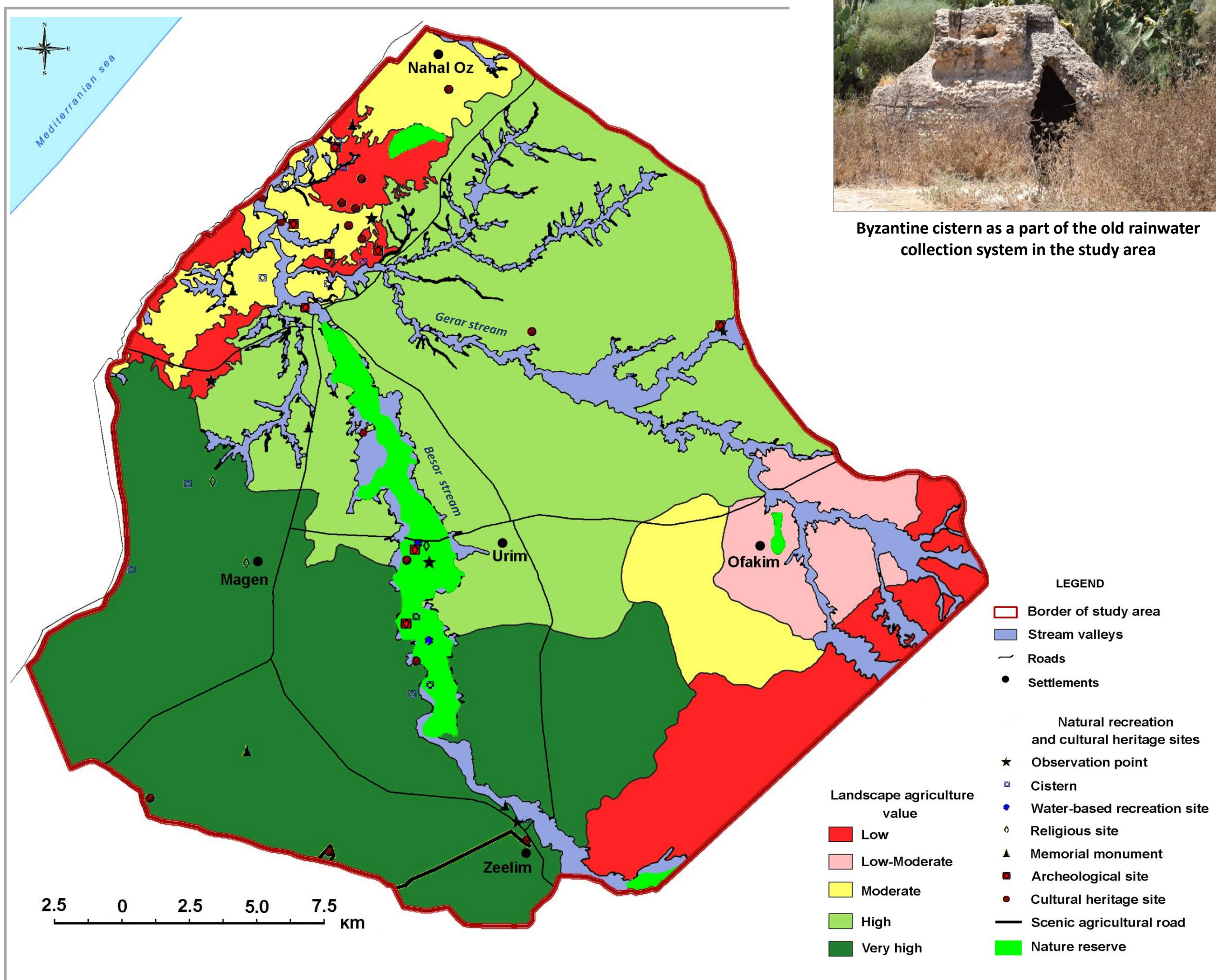


Preparation of loess plain for sowing (A); soil surface crust (B); soil carbonate nodules (C); profile of Light brown loess soil (D)

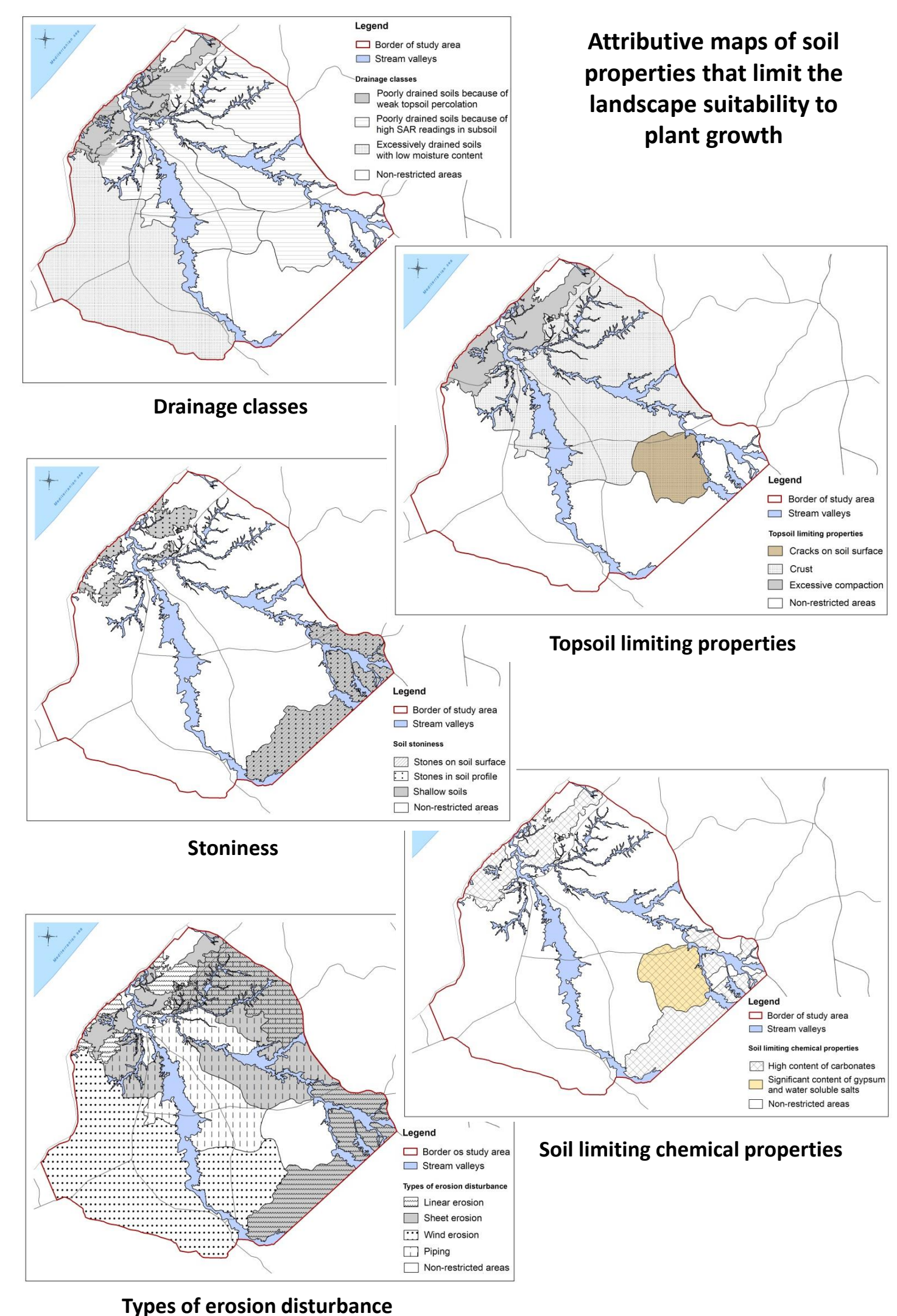


Results

Final map of landscape agricultural suitability and cultural value



Byzantine cistern as a part of the old rainwater collection system in the study area



From the variety of morphological, analytical and spatial soil properties were selected those that limit significantly plant growth and are important for assessment of landscape agricultural suitability, such as types of erosion disturbance, topsoil-limiting properties, stoniness, soil limiting chemical properties and drainage classes. The final map was created by expert assessment of the soil-limiting properties and the location of the cultural heritage sites in the region.