



Fires influence on soil properties in Mt. Carmel, Israel - a long-term view

Naama Tessler¹, Noam Greenbaum^{1,2}, Lea Wittenberg¹ and Dan Malkinson^{1,3}

¹ Department of Geography and Environmental Studies, University of Haifa, Haifa 31905 Israel.² Department of Natural Resources and Environmental Management, University of Haifa. Haifa 31905 Israel.

Soil organic matter (OM), is one of the most fundamental soil components. After a fire OM is destroyed and consequently the physical, chemical and biological properties are altered. Mt. Carmel, Israel, is a typical Mediterranean ecosystem. In the past three decades, nine large fires (more than 120 hectare) and more than 400 smaller fires occurred in the region. Fire severity is a qualitative term that describes ecosystem responses to fire and can be used to describe the effects of fire, particularly on soil. Following fire, the soil undergoes changes that have not been fully studied. The study is aimed at 1) analyzing temporal and spatial changes of soil chemical and physical properties following various forest fires and 2) defining pedological indices of soil rehabilitation. Field methods include a) detailed soil survey and samplings from areas that have been previously burnt. b) Laboratory analyses included: organic matter content (OM), electrical conductivity (EC), pH, NH₄⁺, NO₃⁻, and Phosphorous.

Soil survey and sampling of past-fires were conducted in areas that were burnt during the: 1983, 1989, 1999, 2005 fires and control area. Rehabilitation of OM after high-severity fires is a long-term process and may probably take between 40-50 years. In low-moderate fire the OM rehabilitation is faster ~10 years. The EC after high-severity fire increased immediately to 2.1 dS/m and then decreases to a relatively low value of 0.6 dS/m, for a relatively long period, due to the quick erosion of the ash layer as well as by the fast wash into subsoil. The pH increases abruptly after the fire, but recovers after 1-7 years depending on fire severity. The NH₄⁺/NO₃⁻ relationships show higher amount of NH₄⁺ in the fire areas, while in the control areas the amount of NO₃⁻

is much higher. The tendency of the Phosphorus follows that of the organic matter, which implies to the relations between these two properties. The soil system shows that the main influence of forest fire on soil is on the A horizon (0-10 cm). There are short and long term rehabilitation processes of the soils, but for most soil properties rehabilitation may take several tens of years.