

# Present and past forest fires effect on soil properties - Mt. Carmel, Israel

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## Abstract

Mt. Carmel is a typical Mediterranean ecosystem, which experiences an increasing number of forest wildfires. During the last 28 years, at least 9 large wildfires were recorded, which consumed areas of 80 – 530 hectares each. The study is aimed at 1) analyzing temporal and spatial changes of soil chemical and physical properties following forest fires and 2) defining pedological indices of soil rehabilitation processes.

Field methods include 1) Water Drop Penetration Time (WDPT) tests to quantify soil repellency, 2) Detailed soil survey and 3) Soil and analyses samplings from areas that have been previously burnt. Laboratory analyses included: texture, organic matter content (OM), electrical conductivity (EC), pH, NH<sub>4</sub><sup>+</sup>, NO<sub>3</sub><sup>-</sup>, P, CaCo<sub>3</sub> and Saturation Percentage (SP).

WDPT tests were conducted each month in an area which was burnt in April 2005 and in addition in, areas previously burnt during the 1989, 1998, 1999 and 2003 fires and in unburnt areas. The results from the 2005 fire indicate that hydrophobicity diminishes with time from high to low at soil surface. Very low hydrophobicity and tendency were found deeper at 5 and 10 cm. Hydrophobicity in soil surface is highly correlated with the pre-fire vegetation community.

Soil survey and sampling of past-fires areas were conducted in: 1983, 1989, 1999, 2005 fires and control area. After a high severity fire the OM does not return to control level concentrations. Rehabilitation of the OM in high severity fires is a long-term process > 20 years. In low-moderate fire sites the OM has no yet returned to control levels. The EC increased immediately after the fire up to 2.10 dS/m and then decreases to relatively low values 0.6 dS/m, for a relatively long period. The pH increases abruptly after the fire, but recovers after 1-7 years depending on fire severity. The chemical analyses of nutrients show large variability at all burnt areas.

The soil system shows that the main influence of forest fire on soil is in the A horizon (soil surface 0-5 cm). Hydrophobicity is relatively short phenomenon which diminished with time and related to organic matter amount and fire temperature. Soil properties are long term affected by fires and rehabilitation may take many years.

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