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Wildfire-induced water repellency in British Columbia and its hydrological consequences

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During the summer of 2003, most weather stations in the southern interior of British Columbia, Canada, recorded the hottest and driest June, July and August period on record. Unsurprisingly, the region also experienced one of its worst wildfire seasons and, certainly, the worst urban interface fires. During this 'summer from hell' over 250 000 ha of forest were burned in British Columbia, which was more than three-times the highest area burned during any year in the previous decade. This presentation will catalogue the hydrological consequences of some of these fires and the extent to which water repellent soils played a role in these effects.

Preliminary investigations showed water repellent soils in some of the burned areas immediately after the fires, and a small thunderstorm, during October 2003, caused a remarkable flood and erosion event in a burned ephemeral catchment in Kelowna, BC. Water repellency was not known to have caused post-fire flooding in British Columbia previously, and the risk of flooding was thought to be limited because of the low probability of large rainstorms of high intensity.

The hydrology of the region is strongly dominated by a spring snowmelt, as roughly half of the annual precipitation is received as snow. There was no apparent influence of fire on the spring snowmelt hydrographs, presumably because of the gradual wetting of the soils and the relatively slow melt rates. However, from mid-summer of 2004, six more large landslides and flood events were recorded in the mountains of this region. One of these events occurred off an unburned slope. Of the remaining events, all were related to the effects of fire to some extent. The floods and associated sediments,

blocked highways, damaged roads, buildings and properties. The most damaging flood event, which destroyed two houses and moved another, occurred in a small catchment where the most severe water repellency was found, in granitic soils. These water repellent soils twice lead to widespread overland flow and sheet, rill and channel erosion during brief thunderstorms.

The appearance of the water repellent soils was typical of that reported for fire-induced repellency in the world literature. It is concluded that fire-induced water repellent soils pose a serious threat to catchment stability after wildfires in British Columbia. Erosion risk assessments followed by rehabilitation efforts will be needed if serious loss of life and property is to be averted in future.