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The impact of peatland wildfires on soil acidity

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Wildfire in peatlands is of global importance due to the risk of direct carbon release. While considerable attention is given to carbon release, other wildfire impacts and indirect risks, such as the impact on soil pH, remain less studied. Peatlands characteristically require acidic conditions (soil pH ≤ 4.5) for optimal functioning. However, wildfire-produced ash often has a high pH and ash input into soil could potentially increase soil pH.

We studied a wildfire in a raised-bog peatland in the south of the Netherlands – where considerable peat smoldering and ash production occurred – by combining field observations with lab experiments. We measured the pH of topsoil and ash samples, which were collected from the area approximately two months after the wildfire. A smoldering experiment with peat was done to estimate the alkalinity in freshly produced ash (herein: 'fresh ash') and to be able to compare it to ash collected in the field (herein: 'aged ash'). Finally, the amount of fresh ash needed to increase soil pH was quantified in an incubation and titration experiment with ash and peat soil.

All topsoil samples collected from the field were acidic (pH $\sim 3-4$), even in sampling locations with ash present. Fresh ash produced in the smoldering experiment was alkaline, while aged ash collected during field work was slightly acidic. This indicates that alkalinity was likely leached from the ash by the time of field work. The incubation experiments showed that a ≥ 3 cm ash layer is needed to increase soil pH by at least 1 unit. Results suggest that ash, when produced in high enough quantity, can change peatland soil pH. However, dilution and ageing of the ash after a wildfire, as likely occurred in our field site, will constrain the period of elevated soil pH after wildfires and subsequent ash input. This transient increase in soil pH suggests that even wildfires with considerable ash production do not lead to increased soil pH.