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The impacts of catastrophic 2019/20 Australian wildfires on erosion and water quality: the case of Sydney's main water supply

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The 2019/20 Australian wildfires burned the largest forested area in Australia´s recorded history, with major environmental and socio-economic consequences. These included extensive ash and soil erosion events which threatened water quality in parts on eastern Australia.

The second largest fire was the 280,000 ha Green Wattle Creek Fire, which burned large forested areas of the Warragamba catchment. This protected catchment provides critical ecosystem services for Lake Burragorang, Australia's largest urban supply reservoir delivering ~85 % of the water used in Greater Sydney.

The fire caused major challenges for maintaining the supply of clean water to the Greater Sydney region (> 5 million consumers). Shortly after the fire was contained, an extreme rainfall event (up to ~276 mm in 72 h), caused extensive ash and sediment delivery into the reservoir.

Here we (i) summarise the effects of this unpreceded fire seasons on erosion and water quality in general and (ii) report on the interactions between science and land management to quantify predict and mitigate the risk to water supply for the Greater Sydney region. The latter included assessments of fire severity, ash quantities and their pollutant content using remote sensing and ground measurements, as well as the application and further development of a new modelling tool, WEPPcloud-Wildfire Ash Transport and Risk tool (WEPPcloud-WATAR - https://wepp.cloud -). This tool allows predicting probabilities for sediment, ash and contaminant transport for different rainfall scenarios, and aided the identification of risk hotspots to focus post-fire erosion mitigation measures.

Risk modelling, on-ground monitoring and operational mitigation measures ensured the continuity of safe water supply to Greater Sydney. This collaborative interaction between scientists and water managers, that also allowed the refinement of the model capabilities and its outputs,

exemplifies the successful outcomes that can be achieved through the close collaboration between science and end-users.