Geophysical Research Abstracts
Vol. 19, EGU2017-18443-2, 2017
EGU General Assembly 2017

How long will my reservoir be contaminated following a post-fire erosion event?

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Post fire erosion processes such as debris flows can generate large volumes of sediment, contaminating streams and reservoirs for extended periods. Recent research has enabled the magnitude of the generated load to be reasonably estimated, but what happens once this load of sediment and ash reaches the reservoir? Water treatment plants typically have a threshold contaminant level, above which the treatment capacity is exceeded and the water becomes undeliverable. As hydrologists, soils scientists and geomorphologists we think in terms of volumes of water and masses of sediment, but for water managers the metric that really matters is “How many days will my reservoir be unable to supply water, and what is the chance of that occurring?” Answering this question is difficult as it involves modelling the weather, the fire regime, the post fire hydrology and erosion processes, and finally the hydrodynamics of the reservoir so to be able to predict the propagation of the contaminant plume from the entry point to the reservoir take off point. These models are numerically intensive, and this study develops a new method to combine these models in a way that allows them to be implemented within a Monte Carlo simulation. The new approach was applied to the case study of the Upper Yarra reservoir in south east Australia, the main water supply for Melbourne’s 4M residents. The results indicate that following fire water managers should be prepared for post-fire reservoir contamination events extending from several months to more than a year. The duration of the contamination events was found to be extremely sensitive to the quantity, size distribution, and density of the <5um particles of ash and soil, which makes up a small fraction of the total debris flow load.