Determination of Possible Correlations Between Water Quality Parameters and The Release of Elements: A case study of California Wildfires

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In 2015, the Rocky Fire (~15-20% of watershed burned) and the Wragg Fire (>90% of watershed burned) took place in California, US (United States). In this study, we compared the element concentrations and water quality parameters between the affected watersheds and non-burned (reference) watershed water samples. The goal of this study was to investigate possible correlations between post-fire water quality parameters (i.e., turbidity, apparent color, true color, pH, DOC, DN, $SUVA_{254}$, NH_3, /NH_4^+, NO_2^-, NO_3^-, DON, TDS, TSS, and TS) and the release of trace elements (P, K, Ca, Mg, Zn, Cu, Mn, Fe, S, Na, B, and Al) and create regression models for two California wildfires.

In general, a significant mobilization of elements was observed in fire impacted samples. During the initial flushes (6-8 major flushes), the concentrations of elements and water quality parameters increased significantly in the samples collected from downstream of burn watersheds compared to the reference samples particularly for more extensively burned watershed (>90%) (increases in element concentrations were: 500-600% for P, 350-400% for K, 0-80% for Ca, 30-300% for Mg, 50% for Cu, 100% for Na, 1,900% for B, 0-50% for Al, 1,900% and increases in water quality parameters were: 1,900% for turbidity, 1,900% for apparent color, 300% for DN, 30% for $SUVA_{254}$, 400% for NH_3, /NH_4^+, 200% for DON, 100% for TDS and 3,000% for TSS). For most elements, concentrations were decreased with subsequent flushes indicating a quick recovery after initial flushes. One year later, the concentration of elements decreased and there was no significant difference between reference samples.

These results have shown that treatment facilities should know that there may be a large amount (high concentration) of elements in their source water after such fire events and they must be prepared accordingly. However, the effect can be expected to last less than 1 year depending on the topography and the precipitation regimes.

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