Rocky Mountain (53rd) and South-Central (35th) Sections, GSA, Joint Annual Meeting (April 29–May 2, 2001)
Paper No. 8-0

Presentation Time: 3:30 PM-3:45 PM

CONCEPTUAL MODEL OF MINERALOGICAL AND HYDROCHEMICAL IMPACTS OF THE CERRO GRANDE FIRE, LOS ALAMOS, NEW MEXICO

LONGMIRE, Patrick[1], COUNCE, Dale[1], DALE, Michael[2], CHIPERA, Steve[1], and SNOW, Marjorie[3], (1) Los Alamos National Laboratory, EES Div, MS D469, Los Alamos, NM 87545, plongmire@lanl.gov, (2) New Mexico Environment Department, DOE Oversight Bureau, 134 State Road 4, Suite A, White Rock, NM 87544, (3) Los Alamos National Lab, EES Div, MS D469, Los Alamos, NM 87545

The Cerro Grande fire impacted watersheds near and within Los Alamos National Laboratory. Barium, Ca, CO_3, Fe, Mg, Mn, K, Na, SiO_2, Sr, U, and other trace elements are concentrated in *ponderosa* ash, producing a pH of 9.3 when leached with deionized water. Calcite formed within the ash from the oxidation of organic carbon according to an overall reaction: $CaC_2O_4 + 0.5O_2(g) = CaCO_3 + CO_2(g)$. Reduction of metals occurs as a result of the high temperature of the fire ($\geq 680\ ^0C$) and combustion of organic carbon. These reactions influence the solubility of Mn(II, IV) solids, for example $(Ca, Mn^{2+})Mn_4{}^{4+}O_93H_2O$ observed in fracture fills within the Bandelier Tuff. Elevated concentrations of dissolved Mn(II) have been observed in surface water and alluvial groundwater. Prior to the fire, native waters were characterized by a Ca^{2+}-Na^{+}-HCO_3^{-} composition with TDS < 120 mg/L. Since the fire, storm waters are characterized by a Ca^{2+}-K^{+}-HCO_3^{-}-SO_4^{2-} composition with TDS ranging from 450-1,000 mg/L. Increased concentrations of HCO_3^{-} enhance complexation of U(VI) species as $UO_2(CO_3)_2^{2-}$ and $UO_2(CO_3)_4^{4-}$. Since the fire, surface water is predicted to be at equilibrium with $BaSO_4$, oversaturated with $CaCO_3$ and $SrCO_3$, and undersaturated with $(UO_2)SiO_42H_2O$. MINTEQA2 was used to quantify adsorption of solutes onto hydrous ferric oxide (HFO) occuring in creek channels and alluvial groundwater. The diffuse layer model (DLM) was selected to quantify adsorption of Sr^{2+} and $UO_2{}^{2+}$ onto HFO. Based on the simulations, Ca^{2+} strongly competes with Sr^{2+} and $UO_2{}^{2+}$ for adsorption sites. This competition increases with increasing pH, which may account for increased concentrations of dissolved solutes.

Rocky Mountain (53rd) and South-Central (35th) Sections, GSA, Joint Annual Meeting (April 29–May 2, 2001)
General Information for this Meeting

Session No. 8
Forest Fire Impacts on Hydrochemistry and Hydrology
Sheraton Old Town Hotel: Alvarado FG
1:00 PM-5:00 PM, Monday, 30 April 2001

Geological Society of America *Abstracts with Programs*, Vol. 33, No. 5, April 2001, p. 16

© Copyright 2001 The Geological Society of America (GSA), all rights reserved. Permission is hereby granted to the author(s) of this abstract to reproduce and distribute it freely, for noncommercial purposes. Permission is hereby granted to any individual scientist to download a single copy of this electronic file and reproduce up to 20 paper copies for noncommercial purposes advancing science and education, including classroom use, providing all reproductions include the complete content shown here, including the author information. All other forms of reproduction and/or transmittal are prohibited without written permission from GSA Copyright Permissions.