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Responses of Losing Rivers and Groundwater to a 10 m High Dam Removal, Western Montana, USA

William Woessner (1) and Antony Berthelote (2)

(1) The University of Montana, Geosciences, Missoula, United States (william.woessner@umontana.edu), (2) Salish Kootenai College and The University of Montana (antony_berthelote@skc.edu)

River restoration and associated dam removal activities in the USA are a billion euro per year industry. Unfortunately little is known about the response of the groundwater system to restoration actions, or the role of groundwater in enhancing or minimizing the success of restoration projects. Dam removal is promoted as a positive restoration methodology as it unblocks river corridors allowing fish migration, and it removes aging and obsolete dam structures. In Milltown Montana, USA, a reservoir filled with sediments elevated in metals and arsenic at the junction of the Clark Fork River and Blackfoot River was located behind a 10m high dam. The reservoir was drained, the sediments excavated, the dam removed, and a new channel engineered. The changes in the surrounding sand, gravel and boulder unconfined aquifer and the exchange of river and groundwater were both simulated using MODFLOW and observed during the removal process. Modeling forecasts, using three alternative conceptual models and some parameter estimation resulted in the USEPA, at the cost of over $300,000 euro, preemptively modifying or replacing about 100 domestic wells because of predicted water table lowering. Modeling forecasts, and observed river and groundwater responses showed water levels and river exchange rates were impacted at least 5km downstream and 2km upstream of the dam site. Water table levels were lowered over 6m locally. Modeling forecasts of river and groundwater responses were within the observed water level declines suggesting standard groundwater modeling simulation tools, including the use of alternative conceptual models, are appropriate when attempting to predict physical groundwater impacts of dam removal actions.