## Metals Retention and Remobilization in a Small Mine Drainage Impacted Stream Colonized by *Castor canadensis* (North American Beaver)<sup>1</sup>

N.L. Shepherd and R.W. Nairn<sup>2</sup>

Abstract: This study investigated three aspects of North American Beaver colonization on a mine drainage impacted tributary to Tar Creek (Ottawa County, OK): (1) retention of metals due to the presence of beaver dams, (2) metals contamination of sediments due to long-term loading and, (3) metal remobilization due to anthropogenic dam removal. The study reach of the tributary is approximately 1.6 km and has been impacted by two continuous net alkaline, metals-rich mine drainage sources since 1979. The primary metals of concern are Cd, Fe, Pb, and Zn. The first source, discharging ~380 L/min, was the perennial starting point of the study reach and remained untreated during the study. The second source is located approximately 0.6 km downstream, discharging ~600 L/min and has been treated by a passive treatment system since 2008. Beaver colonization was first noted in late 2013. By the end of 2014, most of the study reach was transformed into a series of beaver impoundments. The study found, compared to historic stream data, the presence of beaver dams exhibited a decrease in Fe and Cd concentrations, with minimal effect on Pb concentrations. The beaver dam receiving the greatest initial metals concentrations had mean Fe and Cd removal efficiencies of 57% and 63%, respectively. Stream sediments contained elevated Cd, Pb, and Zn concentrations, with many of the metals concentrations more than five times the EPA site-specific probable effects concentrations for sediment toxicity (11.1 mg Cd/kg, 150 mg Pb/kg, and 2,083 mg Zn/kg). The removal of beaver dams displayed remobilization of Fe and Cd, with 98% of Fe mobilization occurring at the most upstream dam. Overall, the study highlights the potentially important role beaver can play in the treatment of mine drainage, and their influence as ecosystem engineers.<sup>3</sup>

Additional Key Words: Beaver, Tar Creek, Ecosystem Engineers

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- Nicholas L. Shepherd, Graduate Research Assistant (Student), and Robert W. Nairn, Professor, Center for Restoration of Ecosystems and Watersheds, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK 73019
- 3. Work reported here was conducted near 36°55'30.24"N, 94°52'15.85"W.