

Research & progress in relation to contaminated legacy gold mine tailings in Nova Scotia, Canada at Saint Mary's University

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Gold is often geologically associated with toxic arsenic compounds and can be extracted using mercury amalgamation methods. As a result, historical gold mining sites and modern artisanal mining sites in low-income countries frequently have co-occurring mercury and arsenic contamination. Nova Scotia has a long history of gold mining going back to the mid-1800's. There are over 360 gold mines in 64 historic gold mining districts stretching over a 300-km length of NS. Between 1862 and the mid-1940's, 1.2 million troy ounces of gold were extracted mostly using mercury amalgamation techniques. Due to a lack of environmental regulations in the 1800's, there is a modern legacy of three million tonnes of finely-ground contaminated waste tailings. Mercury-recovery techniques were practiced, but frequently 10 – 25% of mercury was lost to the environment through various means at each ore processing site. It has been conservatively estimated that a total of 3.7 to 9.1 tonnes of mercury may have been released to the NS environment from the 1850's to the 1940's. Since the original ore also included arsenopyrite and other arsenic-bearing pyrites, the gold-mine tailings also contain elevated arsenic. After processing, untreated tailings were frequently slurried into nearby freshwater systems without regard for the consequences. The legacy of localized tailing wastes near freshwater sites in 64 gold-mine regions has resulted in multi-generational chronic exposure to mercury, arsenic and other toxic elements for wildlife and humans. Surprisingly the aquatic impacts remain poorly studied, even over 100 years later. In this presentation I will review the issues, and provide an overview of our DEEHR research team's freshwater biomonitoring and ecotoxicology research at Saint Mary's University since 2014.