

East Sullivan mine site restoration: Current success and perspectives

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The former Zn and Cu East-Sullivan mine, in the Abitibi-Temiscamingue region, was classified among the 28 most polluted sites in Quebec's province, Canada. The occupied area is of 228 ha, 200 ha of which containing 15 M tons of acid generating tailings and 200 000 tons of acid generating waste rock. From 1984 to 1992, an organic cover (wood wastes) was placed on the weathered tailings to prevent further sulphide oxidation. However, the collected water from underneath the tailings became more acidic. Seepage collection was then installed around the tailings' impoundment, in the early 1990's, and the collected acidic effluents were passively treated by constructed wetlands. Twelve strategic sampling points around the organic cover and the wetlands were chosen to monitor water quality, from 2000 to 2014. Systematic measurements were performed, according to the requirements of the existing regulations, on pH, acidity, alkalinity, and metals (Fe, Cu, Zn, Pb). Initial values showed highly contaminated acid mine drainage (pH 2, 7-9 g/L Fe, and up to 35 g/L SO₄²⁻). Over the time, the quality only slightly improved. Then, in the period from 1998 to 2005, the supernatant from the constructed wetlands was flown through the cover. The quality significantly improved and, to the date, final water quality at the Southern and Eastern wetland outfalls meet regulatory requirements (pH > 6, Fe<3mg/L, Cu<0.3mg/L, Zn<0.5mg/L, Pb<0.2mg/L). The revegetation was promoted, owing also to the addition of partially dewatered sludge, from a nearby wastewater treatment plant, incorporated at the surface of the organic cover, as source of nitrogen. The site presently turns naturally into a place to birds' refugee, with more than 190 species listed. An ecotoxicological risk assessment for birdlife, benthivore and piscivore revealed that the Southern and Eastern basins appear to be an acceptable habitat for bird life. Further risk assessment, associated to the presence of Fe and of wood chips in sediments and biota, is ongoing. Moreover, acidic water generated at the eastern part of tailings, not covered by wood wastes yet, still needs careful monitoring.