

MERG Report 2000-3 - Investigations Into Passive Wetlands Treatment Of Mine Drainage to Remove Heavy Metals at Various Sites at UKHM

Laberge Environmental Services

Non-technical summary

Wetlands have been used for decades in the treatment of municipal wastewater (sewage) in many parts of the world. Since the 1980s wetlands have been used in the treatment of acid mine drainage, usually resulting from coal mining.

Recently, natural and constructed wetlands have been researched and utilized for the removal of metals from mine drainage. Most of these wetland treatment systems have been designed and used in temperate climatic areas where pennafrst, extreme minimum temperatures, and limited plant productivity is not a great concern. There is interest in northern regions on the possibility of the application of wetlands as a passive treatment system for metal contaminated mine drainage.

A research program investigating this possibility was initiated in the summer of 1995 in the vicinity of the United Keno Hill Mine property in central Yukon. A pilot wetland treatment system was constructed in May 1995 near the Galkeno 900 adit to determine whether it could improve the quality of its discharge. Sedges (*Carex aquatilis*) were obtained from a local natural wetland unaffected by any mine drainage and planted in the plot.

After the plants were allowed to establish, untreated mine drainage was introduced to the wetland. Monitoring of the wetland continued for one season. Initial results showed that treatment within the wetland reduced concentrations of zinc, cadmium, manganese and nickel. Sulphate reduction in the sediments and formation of insoluble metal sulphides appeared to be the primary process responsible for their removal.

In 1999, further investigations were completed on this pilot project and on some of the natural wetlands which receive untreated mine drainage. Due to insufficient volumes of water flowing through the examined wetlands, they could not be fully evaluated as to their performance in the treatment of waste water. However sediment analyses showed that metals had been attenuated. The colonization of the transplanted sedges (*Carex aquatilis*) in the constructed wetland was evaluated. Successful growth and propagation was apparent. These local sedges appear to be a hardy species capable of withstanding transplanting, and appear to thrive with a minimum of effort. Metal uptake in plant tissues was also examined. Low levels were documented throughout the study area with the exception of high zinc concentration in sedges that were collected from the No Cash wetland. As *Carex aquatilis*, the dominant sedge found in the local wetlands, is generally unpalatable to herbivores, the low and incidental levels of metals found within the tissue of the sedges, poses little environmental concern.

Overall, the preliminary results indicate that there is good potential for the use of wetlands to treat metal contaminated mine drainage.