

REVEGETATION OF A BOREAL GOLD MINE TAILINGS POND¹

Ian Young², John Markham, and Sylvie Renault

Abstract: The Gunnar gold mine in Nopiming Provincial Park, Manitoba dumped non-acid generating tailings over an area of approximately 11 hectares more than seventy years ago. Small-scale studies at the site have shown that the incorporation of an organic amendment (paper mill sludge) can increase plant survival and growth. A large scale study was therefore established in June, 2009 to examine the effectiveness of different amendment treatments on plant growth and stress, as well as changes to tailings fertility. Two waste products from the paper mill industry, paper mill sludge and wood chips, were incorporated into the tailings (at 3.7 and 3.5 kg/m², respectively), along with an application of a 25-5-10 NPK fertilizer at 100 kg N/ha, by rotor-tilling to a depth of 15cm. Additional plots were established and rotor-tilled similarly with one of two fertilizer rates (100 or 250 kg N/ha), but without an organic amendment. Treatments were applied to 15m x 15m plots and replicated five times. Black spruce (*Picea mariana*), willow (*Salix* spp.), alfalfa (*Medicago sativa*), slender wheatgrass (*Agropyron trachycaulum*) and red fescue (*Festuca rubra*) were planted across all plots. Paper mill sludge and fertilizer application resulted in the greatest ground cover and plant growth. Soil organic carbon was also significantly increased in this treatment after the first growing season. The wood chip and high fertilizer rate treatments did not provide any significant benefit for plant growth relative to the low fertilizer treatment. Black spruce survival was similar for all plots receiving the 100 kg N/ha fertilizer rate; however, those receiving 250 kg N/ha fertilization showed lower survival. After two growing seasons, it appears as though incorporating paper mill sludge into the tailings surface (along with fertilization) significantly improves the medium for plant growth. Ongoing work includes further characterization of the tailings with other soil fertility measures as well as investigating relative stress levels between plants grown in different treatments using photosynthetic pigment and proline levels.

Additional Key Words: organic amendment, soil fertility, paper mill sludge, wood chips, plant growth

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² Ian Young, MSc. student, John Markham Associate Professor and Sylvie Renault, Associate Professor, Department of Biological Sciences, University of Manitoba, Winnipeg, R3T 2N2, MB, Canada