## A Novel Method Using Phycoremediation to Reduce Toxic Metals in Surface Waters

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Previous research has demonstrated the effectiveness of phycoremediation, the use of algae to take up pollutants from the environment. The questions that served as the basis for this research were 1) whether filamentous algae could be an effective method for phycoremediation and 2) if that algae could be broken down by worms and used as vermicompost to create safe and fertile soil. A mesocosm experiment was conducted first, which evaluated the uptake of metals by a natural consortium of filamentous algae. It was demonstrated that the algae in the mesocosms that had been spiked with heavy metals (Cu, Cd, Hg, Pb and Zn) retained higher concentrations of said metals than the algae in mesocosms without spikes. The concentrations decreased in the water of the mesocosms without algae, though there was a 150-185% improved reduction of heavy metals in the mesocosms with the algae addition. A vermicompost experiment was then initiated using these algae samples and nine worm compost bins. There were three treatments: bins with (1) high-metal algae, (2) low-metal algae and (3) no algae. The worms successfully decomposed filamentous algae, which was mixed with food waste, demonstrating that filamentous freshwater algae can be used as a vermicompost feedstock. The metal concentrations in the finished compost, including that with the high-metal algae treatment, were well within limits laid out by European compost rules, except for mercury. The vermicompost was nutrient-rich compared to typical expectations for compost and was consistent across all three treatments. To our knowledge, this was the first study to evaluate freshwater algae as a vermicompost amendment and demonstrate its potential for managing nuisance algal blooms. This research suggests that the removal of filamentous algae from surface water is an effective, easily-implemented and eco-friendly means to reduce toxic metals in water bodies. (Supported by: U.S. Environmental Protection Agency’s People Prosperity and the Planet program and Virginia Wesleyan University's Undergraduate Research Program).