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Exploring some ecological engineering solutions for the rehabilitation of acidic mine lakes in Australia

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There are a large number of man-made lakes in the world and an estimated 1800 of these lakes are in Australia alone. Formed after the filling of decommissioning of open-cut mine voids these lakes host a significant of freshwater. Hence, these lakes have the potential to provide large amounts of much needed water resources both for recreational purposes, irrigation and even for drinking water purposes. However, before these resources could be used a number of environmental problems and hazards need to be fixed. The number one problem in these lakes is the high level of acidity that forms from the oxidation of high level of mineral after exposure to oxygen. In this paper, we will present the results from a number of experiments aims at understanding the role played by primary production in the rehabilitation of these and the increase of the pH to acceptable levels, usually above 5, and the improvement of the overall water quality. First we will describe some of the communities forming primary and secondary producers that live in these lakes. Various levels of primary producers were found in the series of study lakes and chl-a concentrations ranged between 0.1 and 4.5 microgram/L which is comparable to the range or oligo to mesotrophic in natural systems. Significant increase in pH was measured in areas were high chl-a concentrations were observed suggesting that an increase in primary production could result in improved water quality in these lakes. In particular these lakes displayed very distinct deep-chlorophyll maxima with concentration reaching 10 times those of surface waters. Additional experiments were conducted to assess primary production in the littoral zone of these lakes showed significant enhancement of primary production by the addition of nutrients. The results of these experiments suggest that the enhancement of primary production in these lakes could possibly result in significant improvement

to water quality.