A Breakdown of the Effects of Coal Ash Contaminants on the Photosynthetic Production of Elodea canadensis

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Annually, over 100 million metric tons of coal ash is created from the combustion of coal. Tens of millions of that waste ends up dumped in old mines, landfills, and slurry ponds which often leak into sources of water. Elodea canadensis is a hardy, plentiful oxidizer in aquatic ecosystems, which provides a basis of life for many species. The purpose of experimentation is to test the rate in which Elodea canadensis produces oxygen when incubated in different contaminants from coal combustion residuals (CCRs) and different pH values thus assessing the possible effects on water quality. Concentrations of 20, 10, 5, 2.5, and 0 percent of 1M solutions of silicon dioxide, calcium oxide, iron (III) oxide, and aluminum oxide were used along with pH values ranging from 4 to 10 to test their effects on Elodea canadensis' photosynthetic production. A dissolved oxygen probe was used to test the production of oxygen within trials. After testing it was found that CCRs have a significant effect on the photosynthetic production of Elodea canadensis. As pH increases, Elodea canadensis becomes less productive. As pH decreases, Elodea canadensis shows to be more productive in weak acids. Overall, as concentrations of coal ash contaminants increase, the photosynthetic production of Elodea canadensis decreases, and was more productive in water containing zero percent of the coal ash contaminants. Iron (III) oxide and aluminum oxide were the most detrimental to the photosynthetic production of elodea canadensis; at 20% concentrations production was halted. If one or two of the most damaging chemical contaminants of coal ash could be targeted in cleanup, it could significantly lower the remediation time frame in the affected areas, and the effects of coal ash on a river's health.