



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>David Marash-Whitman</b>   | <b>Project Number</b><br><b>S0810</b> |
| <b>Project Title</b><br><b>Heavy Metal Trafficking: Rhizofiltration Efficacy of Elodea canadensis in Copper Contaminated Effluents</b>  |                                       |
| <b>Abstract</b><br><b>Objectives/Goals</b><br>The goal of this project was to determine the viability of 'green cleaning' using rhizofiltration by looking at the efficiency of an aquatic plant such as elodea canadensis in the removal of copper from polluted effluents across a broad range of contamination levels, and determining a range in which it is useful.<br><b>Methods/Materials</b><br>To assess copper absorption over time, extracted 10 ml samples from beakers with water at 0(control),0.5,1.0,5,10,50,100 ppm initial copper contamination level and elodea canadensis plantings. Measured copper levels using an ion specific meter at one day intervals for 6 days. Also determined final copper content in plant matter by ashing plant material, mixing with nitric acid and diluting accordingly, measuring copper with ion meter, and calculating total copper content using derived equations.<br><b>Results</b><br>Greatest copper reduction (85-90%) for initial copper concentrations between 1 -10 ppm, more limited reduction (70%) for 0.5 ppm and for higher concentrations of 50 and 100 ppm (55- 60%). Plant morphology and water turbidity indicated health of the plants at higher concentrations deteriorated halfway into the runs. Results from ashing plantings and measuring the final copper content showed increase in total copper absorbed with increasing initial contamination levels, tapering off as concentrations got very high (50,100 ppm). Measurements for total copper absorbed in ashed plants was within 30% of the total copper calculated to have been removed based on reduction in contamination levels in the water samples.<br><b>Conclusions/Discussion</b><br>Contrary to published speculations and my hypothesis, results proved elodea canadensis a very effective hyperaccumulator across a broader range of copper pollution levels (0.5 - 100 ppm) than expected. Lesser effectiveness at very low dose indicated that contamination concentrations of 0.5 ppm may be lower than a threshold for the plant's hyperaccumulation activity to be in full effect or too close to accuracy limitations of the ionmeter used. More limited rhizofiltration efficiency coupled with faster plant deterioration and greater water turbidity at high copper doses after 4 days, was probably due to the negative effect on the plants of more copper accumulated in each plant than it could handle. This can be addressed by cycling out plants as they reach maximum (copper) holding capacity. |                                       |
| <b>Summary Statement</b><br>This research showed that rhizofiltration using aquatic plants such as elodea canadensis is a promising solution to addressing copper contamination in our creeks and bay.  |                                       |
| <b>Help Received</b><br>Mother and grandmother helped with pasting the board, Mrs. Cahn showed me how to do the ashing, Cheri Donelly of West Valley Clean Water Program and LabPro staff were information resources  |                                       |