



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

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Project Title Development of Algae as a Biofilter for Phosphate Reclamation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Phosphorus supply may become limited in the future. The world's food supply relies on a continuous supply of phosphate in the form of fertilizer. The purpose of this project is to see if the use of algae is a viable way to reclaim phosphorus and remove it from freshwater and in doing so prevent phosphorus from reaching the ocean where it is lost and can have a detrimental ecological impact.</p> <p>Methods/Materials Methods: Algae were cultured in a sterile environment, under illumination at 24°C. Cultures were maintained by media replenishment no less than once every week. Experimental conditions were similar to culture conditions with varied concentrations of phosphates and nitrates at a density of 12g/L. Samples were removed for phosphate, nitrate, and/or weight analysis. Materials: Algae were sourced from Caroline Biological, University of Texas Culture Collection, Petco. Alga-gro was the selected culture media. Chemicals were sourced from chemical suppliers.</p> <p>Results Rates were calculated for the phosphate depletion by <i>C. aegagropila</i> at different starting concentrations of dissolved phosphate. It was calculated that the mean dissolved phosphate depletion at the lowest concentration of phosphate (mean 1.0 ± 0.1 mg/L) was $1.27 \pm 0.21 \times 10^{-14}$ moles PO_4/cell/hour. When the concentration of phosphate was increased to 5.3 mg/L the rate of depletion was $3.98 \pm 0.01 \times 10^{-14}$ moles PO_4/cell/hour. When the concentration of phosphate was increased to 9.8 mg/L the rate of depletion was $1.07 \pm 0.1 \times 10^{-13}$ moles PO_4/cell/hour. A scatter plot of phosphate concentration versus rate was created and approximated a curve showing a lag phase and an exponential component. A best fit curve revealed an equation of $y = 7.66e^{0.2846x}$. Depletion rates for <i>C. aegagropila</i> were compared to alternative green algae species reported in the literature and found to be comparable. A biomass evaluation demonstrated an increase of 53% over a two week period. During this study media was continually replenished every 48 hours to more closely model a continuous flow freshwater situation.</p> <p>Conclusions/Discussion These results support the hypothesis that if algae (specifically <i>C. aegagropila</i>) were to be incubated with phosphate under controlled conditions, the phosphate levels would gradually decline and the biomass of the algae will increase as the algae utilize the phosphate to grow. The results of this study support this hypothesis.</p>	
Summary Statement The development of algae as a biofilter for phosphate reclamation and alleviation of excess runoff nutrients.	
Help Received Used lab equipment at the San Diego Jewish Academy high school under the supervision of our project advisor Dr. Jane Willoughby.	