



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Vijay Yanamadala	Project Number S0811
Project Title Reclaiming the Ecosystem: Eutrophication Control with Calcium Carbonate Filters and Denitrification in Fresh Water Lakes	
Abstract Objectives/Goals Eutrophication, the process by which a lake becomes rich in dissolved nutrients due to point and non-point pollutant sources, is a major cause of the loss of natural lake ecosystems throughout the world. Especially in Madrona Marsh, one of the last remaining vernal marshes in the Greater Los Angeles Area, cultural eutrophication has become a major problem. Methods/Materials This experiment involved the testing of calcium carbonate as a phosphate binder in the laboratory and in the real ecosystem. A calcium carbonate lacing procedure was first carried out in order to determine its efficacy in Madrona Marsh. This was followed by an ammonia study. Ammonia interferes with the solubility of calcium carbonate and therefore hinders the reduction of phosphate. Various approaches for reduction of ammonia were tested including aeration, use of bacteria growth medium, and plants, mainly in an attempt to increase population of Nitrobacter and Nitrosomonas. In addition soil sampling, sediment analysis, microscopic plant analysis, microorganism and macroinvertebrate identification, and rate law formulations were conducted. This was followed by the construction of various phosphate binding calcium carbonate filters, which utilized the ion exchange principle, including a spring loading filter, PVC pipe filter, a galvanized filter, and an agitator clarifier system. All were tested with the aid of Stoke's Law. Results Calcium carbonate was found to be an excellent phosphate binder, reducing up to 70% of the phosphates in the lacing procedure, and the ammonia control phase also worked successfully, reducing ammonia, on average, by 0.2 ppm. The auxiliary phases were successful in determining the safety of the calcium carbonate, and the filters were built on that basis. The filters worked well, reducing phosphates significantly and producing high flow rates and clarity overall. Conclusions/Discussion The experiment was extremely successful in designing a working phosphate binding and ammonia reducing filter, and a large scale filter is currently being constructed in Madrona Marsh; this filter will reduce phosphate and ammonia levels substantially in the following years.	
Summary Statement Various nutrients such as phosphates flow into lakes through a process known as eutrophication, which results in major ecological and economic problems; I attempted to find a solution to eutrophication by reducing phosphate in the water.	
Help Received Used lab at high school	