# CALIFORNIA STATE SCIENCE FAIR
# 2007 PROJECT SUMMARY

**Name(s)**
Shaheen Jeeawoody

**Project Number**
27383

**Project Title**
## Bioremediation: Protecting Our Aquatic Ecosystems from Eutrophication

**Abstract**

**Objectives/Goals**
Eutrophication is the process by which large additions of nitrates and phosphates cause an overgrowth of algae, which depletes oxygen levels and causes damage to water ecosystems. One environmentally friendly method to clean up water pollutants is bioremediation. The purpose of my project is to investigate the effects of bacteria, such as Pseudomonas putida and Serratia marcescens, on nitrates and phosphates in contaminated waters.

**Methods/Materials**
I filled 84 Mason jars with distilled water and sugar. Half of the jars received Pseudomonas putida, while the other received Serratia marcescens. I varied the amount of nitrates and phosphates and closed all jars. Using Vernier probes connected to my laptop and LaMotte test kits in parallel, I measured the levels of pH, dissolved oxygen, nitrate, and phosphate for 2 weeks.
I wanted to find out the levels of pollutants in our waters. I collected water samples from two Santa Clara County reservoirs after heavy rains and 2 weeks afterwards. I tested those water samples for pH, dissolved oxygen, nitrates, phosphates, and bacteria.

**Results**
The pH levels gradually decreased from 7.3 to 4.1 in the nitrate jars and from 8.5 to 3 in the phosphate jars. Dissolved oxygen levels lowered sharply from 8.9 to 1.4 mg/L in the nitrate jars and from 7.7 to 1.3 mg/L in the phosphate jars. An overall decrease in nitrate levels was seen in the nitrate jars. The Pseudomonas putida jars showed decreases ranging from 44% (high nitrate concentration) to 97% (low nitrate concentration), while the Serratia marcescens jars showed reductions from 58% (high) to 94% (low). Phosphate levels decreased in all phosphate jars to nearly 0 mg/L, thus showing more than 90% effectiveness.
In my field tests, I found that the two Santa Clara County reservoirs have good pH and dissolved oxygen levels, and bacteria are present there, but the nitrate and phosphate levels are high and thus exceed EPA standards.

**Conclusions/Discussion**
Bacteria, such as Pseudomonas putida and Serratia marcescens, do degrade nitrates and phosphates and thus can prevent eutrophication. Serratia marcescens works more efficiently than Pseudomonas putida. Bioremediation is an environmentally friendly method as it is a natural process and the waste products are harmless. It can be applied to clean up pollutants in various ecosystems.

**Summary Statement**
The purpose of my project is to investigate the effects of bacteria, such as Pseudomonas putida and Serratia marcescens, on nitrates and phosphates in contaminated waters.

**Help Received**
My mother helped me gather the materials I needed and taught me how to use the Vernier probes. My teacher gave helpful advice. My father supported me and my sister helped with the display board.