



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Christy E. Warden	Project Number S1912
Project Title Fishing for Efficiency: A Study of Symbiotic Relationships	
Objectives/Goals My objective was to study the efficiency and commercial potential of growing plants in a system that mimicked symbiosis between plants and fish. I wanted to grow plants in a hydroponic system, but didn't want to use chemicals associated with this. I built a system that utilized fish waste as a fertilizer for plants and compared their growth to traditionally grown plants.	
Abstract Methods/Materials 2 five gallon buckets, A goldfish, Four California Bell Pepper plants, Water, Dirt and pot, A fountain pump, A ball siphon, Clear tubing, Lava rocks, Fish food, Ply wood, A ruler, Lab Book I built a system that pumped water from a fish tank containing one fish into a plant tray where plants absorbed the nutrients from the water. The water then flowed back down to the fish through a ball siphon. I planted two plants in this system and two plants in normal soil. I compared the growth of plants in each system and fed the fish/noted its behavior each day. I recorded this information in my lab book.	
Results The plants grew for a total of 47 days. The experimental plants averaged a growth of 1/47 centimeters per day and the traditional plants averaged 7/94 centimeters per day. The traditional plants grew faster while the experimental plants deteriorated in health.	
Conclusions/Discussion The results of my experiment with the pepper plants is that the symbiotic relationship is not viable for the growth of these plants however I do not think that this experiment warrants a rejection of my hypothesis. I think that the nature of the pepper plant that I used prevented it from being successful in an aquaponic system at all, because these plants do not typically live in moist climates and did not take well to their roots constantly being submerged in water. The growth of the algae in the system may have also been detrimental to the plants. In another sense, the growth of the algae proves that my hypothesis still could stand because the algae thrived in the system and clearly took in nutrients from the water. Plant life can be sustained in the system, just not pepper plants. I am now experimenting with apple mint plants that typically grow in moist climates. Thus far, the growth of these plants is equal to the growth of the traditional plants. All in all, this experiment has opened doors for further research into the viability of aquaponic systems.	
Summary Statement My project tests the efficiency and potential of mimicking symbiosis between plants and fish.	
Help Received My father helped me use a saw to cut the bucket and drill a hole in it.	