



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Ethan Uetrecht	Project Number J1119
Project Title The Effects of Greywater on the Development of the Pieris rapae Butterfly	
Abstract Objectives/Goals The practice of using greywater in home gardens is becoming more popular as a way to conserve water. While researchers have found that greywater has little effect on plants, it is unknown whether greywater has an effect on the consumers of the plants. The purpose of this project was to test whether eating plants watered with greywater would affect the development of the Pieris rapae caterpillar from larva to butterfly. This experiment is important because an increase in greywater use may affect plant consumers and other animals in the food web. Methods/Materials In this project, 24 caterpillars were divided into two groups of twelve. One group was fed Brassica oleracea leaves from plants watered with greywater. The control group was fed leaves from plants watered with regular water. Larvae growth, pupa length, and pupation time were recorded. Photographs were taken of the butterflies and were analyzed to measure hindwing area and forewing length. Results Data for this experiment was collected over 45 days. All 24 larvae emerged as butterflies with no mortalities or deformities. There was no significant difference in caterpillar, pupa, or forewing length. However, the greywater specimens spent longer on average in the pupa stage and had a larger average hindwing area than the control specimens. Conclusions/Discussion These results indicate that greywater may affect Pieris rapae development. More studies should be conducted to determine whether greywater has a harmful or beneficial effect on plant consumers.	
Summary Statement The purpose of this project was to test whether eating plants watered with greywater would affect the development of the Pieris rapae caterpillar from larva to butterfly.	
Help Received My mom taught me how to use Excel and ImageJ; My sister provided guidance on how to organize the research report; Jessica Pratt of UC Irvine provided suggestions on how to design the experiment.	