



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Emma R. Freedman	Project Number J1106
Project Title Rollin' on the River Testing the Effects of Deforestation on the Water Quality of the Kinabatangan River in Borneo	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To compare the health of a location on the Kinabatangan River to a tributary that runs through a region of deforestation by measuring water quality.</p> <p>Methods/Materials Samples were taken in a location where a tributary goes through deforestation then joins the Kinabatangan River in Borneo. Permission to test was obtained from Eugene Tan, a Malaysian landowner on the Kinabatangan River. Samples were taken upriver, downriver, and in the mouth of the tributary. The sample bucket and dissolved oxygen test bottle were filled with sample water from the middle of the river, just below the surface. Time, GPS reading, temp. of water, and image of sample water were recorded. Five tests were performed on each sample using a water quality test kit from Lamotte: DO ppm (Winkler Method), turbidity JTU, alkalinity ppm, pH, and nitrate-nitrogen ppm. Samples were taken in the morning and afternoon in each of the 3 locations over 4 days for a total of 54 samples. Measures were taken to randomize the samples to better capture the natural fluctuations of the environment. After each sample, equipment was washed in mineral water. All wastewater was collected and taken to the city for safe disposal.</p> <p>Results After analysis, the data suggests that the mouth of the Lokan tributary is less healthy than the Kinabatangan upriver. The alkalinity and pH levels appear to be lower in the Lokan. This suggests that the water is slightly more acidic because it has less capacity to buffer fluctuations in pH. The Lokan has the lowest dissolved oxygen compared to the main river. The dissolved oxygen appears to be lower in the afternoon. In the afternoon, the Lokan has the highest nitrate-nitrogen levels compare to the main river. In all locations, the turbidity is higher in the afternoon. The Lokan is extremely turbid in the afternoon.</p> <p>Conclusions/Discussion My data suggests that the water quality of the Kinabatangan River is affected by deforestation. Lower pH, alkalinity, and dissolved oxygen levels and higher turbidity and nitrate nitrogen levels suggest that the water in the Lokan is less healthy than the Kinabatangan River. In all of the tests there are fluctuations between the morning and afternoon. This study provides a baseline for other studies in the area and I would like to return and test how this location changes over time. This important ecosystem is threatened. We need to learn what we can before it, and the Orangutans are gone.</p>	
Summary Statement I am interested in the effects of deforestation on the orangutans in Borneo so I tested water quality as an indicator of deforestation at a study site on the Kinabatangan River.	
Help Received Dr. David Bernick is my mentor and introduced me to R; Mr. Eugene Tan gave me permission to test near his river lodge; Two Malaysian river guides and my little brother were my assistants; My mother recorded the data that we found and helped me with background research; My dad helped me use R.	