



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

<b>Name(s)</b> <b>Carlyn Girard; Ian Girard</b>	<b>Project Number</b> <b>J0214</b>
<b>Project Title</b> <b>Lasers See Like Salmon Eyes</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> We built two low cost turbidity monitors, using lasers, photocells and a data logger. We tested the monitors with different concentrations of sediment, different laser path lengths and different types of sediment. We field-tested the monitors at a local stream called Jacoby Creek under flood and low flow conditions.</p> <p><b>Results</b> Both monitors showed that changes in the voltage from the photocells were directly related to the concentration of sediment in the water. The voltage responded linearly up to 400 milligrams per liter (mg/l). Correlation coefficients between voltage and sediment up to 400 mg/l were above 0.9 for all the data logger tests. Above 400 mg/l the data followed an exponential trend line. Increased path length increased voltage from the photocells for the same turbidity. The finest clay-silt sediment that we could get was just as detectable as the heavier silt-sand sediment. The sand sediment was not detectable up to 450 mg/l. Our turbidity monitors survived a flood. It rained almost 4 centimeters in 24 hours! They were under two meters of water at the storm peak.</p> <p><b>Conclusions/Discussion</b> Our monitors can be constructed for about \$150 each and can accurately measure suspended sediment concentration from 20 mg/l to 400 mg/l. We proved that the design works under pretty harsh conditions. Our tests did not give the results we had expected for path length. Increased path length, increased voltage output because the laser light spread out over more of the photocell. Based on our sediment tests our monitors should be able to measure accurately most of the types of sediment that you would find during storms in Jacoby Creek.</p>	
<b>Summary Statement</b> We designed, built and tested two in-stream turbidity monitors.	
<b>Help Received</b> Two hydrologists helped teach us about turbidity and turbidity sampling, our dad helped us with the dangerous parts of construction, our science teacher advised us on the project.	