



# CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

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<b>Project Title</b> <b>Hydraulic Ram Pump</b>	
<b>Objectives/Goals</b> Our project was to build a fully automated water pump using no electricity. The water pump mainly ran on water force and pressure. We also tested the efficiency of the pump on three different modes that could be adjusted with the spring tension settings on the main pump itself. We believed that the medium setting on the spring tension would be the most efficient for our situation. <b>Abstract</b> <b>Methods/Materials</b> A three feet, 1" PVC pipe going downhill and a six feet 3/4" PVC pipe going uphill was assembled to simulate a downhill/uphill relationship. The main valve consisted of a 1" PVC male pipe plug and adapter as the main components. There was a metal rod that connected all the parts to the pipe plug and adapter. Those parts included the two extension springs, a metal clamp to connect the springs, paper clips, and two pieces of plastic that would act as a piston and support for the springs. We tested the pump by running water into a milk carton (acting as a reservoir of water) that eventually ran downhill and reached the main pump. From that point, the water was pumped uphill. We conducted tests with the three modes set on the spring tension. <b>Results</b> The results are Mode 2 (medium speed, medium power) ran 53.2% more efficient and reliable than Mode 1 (low speed, high power). Mode 2 also ran 21% faster than Mode 1 making it the superior mode to choose for our situation (three feet downhill, five feet uphill). Mode 3 (high speed, low power) was not able to reach five feet so Mode 2 was 100% more efficient than Mode 3. Mode 1 ran at 1.893 milliliters per second while Mode 2 ran at 2.395 milliliters per second. Overall Mode 2 ran 53.2% more efficient and 21% faster than Mode 1. Mode 3 was unable to be tested. Other situations may change the efficiency of the modes. <b>Conclusions/Discussion</b> The answer shows how great the water pump works at full efficiency. If this project can go into a much larger scale, the world can change one at a time by conserving energy and helping people in need of water. We learned that different modes suit different needs and situations. Other nations without power can find this pump useful and efficient for their needs.	
<b>Summary Statement</b> The project is to build a fully-automated water pump that used hydraulics and physics to pump water rushing downhill to an elevated level uphill.	
<b>Help Received</b> Father helped assemble the main valve together and assemble the pipes together.	