



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

|   |                                    |
|---|------------------------------------|
| <b>Name(s)</b><br>Shayne M. Hayes   | <b>Project Number</b><br><br>31133 |
| <b>Project Title</b><br><b>Predicting When My Neighborhood Will Flood Again: A Study of the Sensitivity of the San Lorenzo River</b>  |                                    |
| <p align="center"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>         The main idea of my science fair project is to come up with a basic mathematical equation that can model the height of the San Lorenzo River using years of river data and some soil saturation tests of my own.</p> <p><b>Methods/Materials</b><br/>         Before I create an equation that can model the height of the San Lorenzo River, there is some field data I must collect. One of the variables is the soil saturation, to see how much water will be or is running into the San Lorenzo River while it is raining outside. Because there is no data on the condition of the soil near the San Lorenzo River, I must get that data by testing how much water the soil can absorb. I will get this data by taking two soil samples (one of which is close to 100% saturated), weighing them, baking them, and then weighing them again to see how much water the soil can absorb.</p> <p><b>Results</b><br/>         Based on my analysis, there is a strong correlation between the amount of rain received, the level of soil saturation and the river rise. When the soil is 100% saturated, the river goes up 6X as much as it would if the soil is not saturated. Also, when the soil is saturated, the river's peak is delayed by 2.5 hours after the peak rain. Finally, based on my soil saturation test, soil is 100% saturated when it contains 26% water by weight, which is 34.5% water by volume. This means it would take no more than 2 inches of rain to fully saturate the top 6 inches of soil.</p> <p><b>Conclusions/Discussion</b><br/>         I have concluded that my hypothesis was correct; it is possible to make a simple mathematical model to predict the height of the San Lorenzo River:<br/> <math>\Delta H = r * S</math><br/>         Where <math>\Delta H</math> is the rise of the river, <math>r</math> is the rainfall in the last four hours and <math>S</math> is the soil saturation factor (which is determined by an equation based on the rain over the previous 12 hours).<br/>         This means that if the soil is 100% saturated and the river is at 10 feet, and we get another inch of rain in three hours, I can predict that the river will flood in 2.5 hours and could prepare to evacuate.<br/>         It may not be totally accurate, for storms move and come in different sizes with different rain rates, but it will at least give me an idea of whether or not the river will flood.</p> |                                    |
| <b>Summary Statement</b><br>My project was to develop a basic mathematical equation that can model the height of the San Lorenzo River using rainfall and river data and measured soil saturation.  |                                    |
| <b>Help Received</b><br>My dad helped me collect rainfall data and suggested some ways to analyze the data.   |                                    |