



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

<b>Name(s)</b> <b>Julie Cline; Munira Rahman</b>	<b>Project Number</b> <b>S0603</b>
<b>Project Title</b> <b>Why Is Sand the Best Material to Use as a Barrier Against Floodwaters?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My project was to determine why sand was the best material to be used as a barrier against floodwaters. Sand is the best material that can be used as a barrier against floods because of: its ability to mold around objects (especially other sandbags), has more volume of air trapped in spaces, and sand creates a maze of air. Sand will have the least amount of percolation when compared to gravel, fine gravel, and plant soil, because sand particles mold around each other so well due to its properties. The air space in sand will be the least compared to the other materials used since it is the most compact and can hold back more water due to its property of percolation.</p> <p><b>Methods/Materials</b> We used wood to create a flood table on which we tested the burlap sandbags, which were filled with sand, gravel, fine gravel, and plant soil. Each material was tested separately for five trials for a time period of twenty five seconds in a flood table simulation. Percolation was tested by pouring water through each of the materials separately in an empty bottomless water bottle. Air space was tested by measuring the displacement of water in the different materials by using a graduated cylinder.</p> <p><b>Results</b> According to our flood table experiments, the soil was the best material to use. For the air space experiment, soil had the largest amount of air space, following it was gravel, then sand, and fine gravel had the least amount. For our percolation experiments soil had the least amount in both dry and wet scenarios, while sand had the next lowest percolation rate, followed by fine gravel, and gravel had the largest percolation in both scenarios.</p> <p><b>Conclusions/Discussion</b> Our experiments were only conducted for a mere 25 seconds, while in real conditions floods will last for hours, days, and sometimes even weeks. The fact of the matter is that sand is the better contestant. Sand will harden up in the sun but it can be reshaped. It can hold its form much better than soil. The problem with our experiment would be that the trials were not long enough, and because of this reason the soil held back water well in short conditions.</p>	
<b>Summary Statement</b> This project was conducted to find out why sand is the best and most widely used material in sandbags to protect against floodwaters.	
<b>Help Received</b> Tariq Ahmed and Shams Rahman provided sandbag materials. Dennis Cline helped build the flood table. Milly Cline assisted in timing the experiment and bought the burlap. Mr. Lusardi provided the stopwatch. Ralph Murphy, Rich Reeves, Rick Jirsa, and Mike Reason provided their expert opinions as geologists.	