



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title Wind Breakers: A Study of Wind Barrier Effectiveness	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To compare barrier effectiveness of 7 realistic barrier designs based on sand obstruction, amount of sand deposited, and wind speed variation.</p> <p>Methods/Materials A wind tunnel generating wind speeds to 35mph was constructed using plywood, Plexiglas, a swamp cooler, indoor/outdoor carpet (agricultural field simulation), and a series of PVC pipes to evenly distribute wind. The tunnel tested the effectiveness of 7 barrier designs constructed of solid pine, wood shingles, and conifer tree branches to represent commonly used solid, semi-porous, and porous barriers. 3500 grams of playground sand was spread between the wind source and the barrier. Wind was generated and sand was blown for 3 minute periods. Sand was collected separately in front of the barrier and from two 27" segments behind the barrier using a shop vac. Wind speed and mass of sand deposited on each segment were recorded for all 16 trials. Changes in pressure and wind flow patterns were observed using a homemade tuft and a series of longer strands of yarn attached to a rod.</p> <p>Results The solid barrier/plants in front blocked 73% (2571.2g) of the initial sand, the fence barrier/plants behind blocked 73% (2537.5g), the solid barrier/plants behind blocked 71%, the solid barrier blocked 67%, the fence barrier blocked 58%, the fence barrier/plants in front blocked 44%, while the plant barrier blocked only 25%. The fence barrier decreased wind speed 17.0mph, the solid barrier decreased wind speed 16.7mph, the fence barrier/plants behind decreased wind speed 13.7mph, the solid barrier/plants behind decreased wind speed 13.0mph, the fence barrier/plants in front decreasing wind speed 12.7mph, the solid barrier/plants in front decreased wind speed 11.7mph, and decreasing wind speed the least was the plant barrier by only 9.0mph.</p> <p>Conclusions/Discussion The control showed that the most damage from both wind and sand will be done if no barrier exists. The most sand (2571.2g) was blocked by the solid barrier/plants in front (73%). The most sand was deposited (1325.3g) on the crop area when the plant barrier was used. The fence alone was the best windbreak, as it decreased the wind speed most significantly (17mph), but its sand blocking capabilities were not of equal caliber as it was ranked 5th blocking only 58% of the initial sand. The three most effective sand barriers were combinations of barriers and were within 2% efficiency of each other.</p>	
Summary Statement To compare barrier effectiveness between 7 realistic barrier designs based on sand obstruction, amount of sand deposited, and wind speed variation.	
Help Received Father instructed and supervised use of all power tools.	