



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s)	Project Number
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Project Title	
Is Horse Manure a Possible Energy Source When Compared to Charcoal, Wood, and Buffalo Manure?	
Objectives/Goals	
There are over 8,000 horses in Ramona, California where I live. Is horse manure a possible energy source? Why hasn't horse manure been used as a fuel source in the past like buffalo chips? I compared the amount of energy(heat) from wood, charcoal, buffalo chips and horse manure to see how horse manure stacked up against these more common fuel sources.Perhaps horse manure could be a possible energy source in a crisis. I wanted to know!	
Methods/Materials	
I created and built a fire pit that would act like a calorimeter. Composed of fire bricks it would have the burning fuel in the bottom and a lid of sorts on top in which the can containing water could sit above the heat. At one minute intervals the temperature of the water could be taken with a thermometer and plotted.This was done over several runs with each fuel and averaged. The calories and joules were computed. Calories are computed by taking the amount of water heated in grams, "n" and multiplying by the difference of the maximum temperature obtained minus the beginning temperature, "t". This gives calories obtained and to get joules this figure is multiplied by 4.2.	
Results	
As expected the charcoal gave the most heat (21,638 joules). Next was the buffalo chips (19,286 joules). Horse manure (12,701 joules) and then wood (10,349 joules) was last. It was very obvious that horse manure could be an energy source. But other factors became apparent during the testing process. The wood, charcoal and buffalo chips were easy to handle and were collect. The horse manure,when dry, crumbles and flakes into tiny pieces. This is why the early settlers on the plains didn't use horse manure- it was very difficult to find and collect!! It also doesn't stack well.	
Conclusions/Discussion	
Horse manure is another source of energy and therefore heat.It burned very much like other more common fuel like wood and charcoal, and is like buffalo chips in gathering method and cost(free from a kind horse!). It was very interesting to see the differences in the four fuels and how they burned. But it was clear that horse manure is much more difficult to manage as a fuel because of the way it falls apart when dry.	
Summary Statement	
Charcoal, wood, buffalo manure and horse manure were burned in a home-made fire pit which acted like a calorimeter to compare heat energy given off.	
Help Received	
Buffalo chips were gathered at Star B Buffalo Ranch, The Pott Belly Shop provided fire bricks	