



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Elizabeth de la Torre	Project Number J2305
Project Title The Effect of Ashes on Seed Viability and an Epigeic Worm's Mortality	
Abstract Objectives/Goals In 2005, Rancho Palos Verdes suffered a 200 acre wildfire. This project investigates the effect of residual ashes to the viability of seeds indigenous to the area, expressed through seed germination rates and seed embryo root elongation; and the mortality rate of the epigeic (surface dwelling) earthworm <i>Eisenia fetida</i> . While wildfires are destructive, ironically, ashes are occasionally a recommended fertilizer, and some chaparral plant species have adapted to particular fire regimes. Methods/Materials Each species of seed was exposed to 5 concentrations of ashes in 5 containers, 10 seeds each, with sterile silica sand, (a 6th cup, excluded ashes: control), kept in a dark germinator (20-23.9°C) until germination started, then 16-18°C dark-8hrs to 22-24°C light-16hrs, and examined upon control's 65% (or maximum) germination. Prior exposure, each species was treated to overcome dormancy. <i>E. fetida</i> was exposed to the same 5 concentrations in 5 containers, 10 worms each, with sterile soil (a 6th container excluded ashes: control), kept in the dark (20-24°C) 14 days; then mortality was recorded. Both procedures were replicated 3 times. Substrates were kept 35% moist @ 6.8-7pH. Ashes were made from vegetation common to the wildfire area. Results For all 6 seed species, the mean germination rates: 7%, 23%, 38%, 58%, 64%, 85%; mean elongation (cm): .53, 1.97, 2.21, 3.13, 3.78, 4.16. <i>E. fetida</i> 's mortality ranged: 33%, 3%, 0%, 7%, 0%. Results were based on 5 ash levels + control in this sequence: 2.35cm, 1.17cm, .59cm, .29cm, .15cm, none. Tested ashes contained surplus phosphorous (>14ppm) & potassium (>220ppm). At the highest concentration level 3 species of seed failed to germinate. Conclusions/Discussion Thus, while research suggests some flora benefit from ashes, ashes at all 5 concentration levels inhibited the germination rates and embryo root elongation of all 6 species of herbaceous plant seeds, native to Rancho Palos Verdes' chaparral and coastal scrub. The overall mean germination rate decreased up to 92% and the overall mean root elongation decreased up to 87%, compared to the control groups. The elevated level of phosphorous & potassium found in the ashes may have caused or contributed to the reduced germination rates and root elongations. <i>E. fetida</i> suffered up to a 33% mortality. Thus, residual ashes, especially high concentrations, following a wildfire, should be dispersed to promote restoration.	
Summary Statement Ashes inhibited seed germination and root elongation, and caused <i>E. fetida</i> to suffer up to a 33% mortality. Thus dispersal of the residual ashes to less destructive concentrations may reduce the risk of erosion and aid restoration.	
Help Received My father provided supplies, equipment, encouragement, and helped me build an indoor greenhouse.	