



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

Name(s) Daniel M. Kari	Project Number S1711
Project Title Helping Pinus ponderosa Fight Dendroctonus brevicomis and Dendroctonus ponderosae: Year II	
Abstract Objectives/Goals This project focuses on discovering natural ways to best preserve Pinus ponderosa from attacks by Dendroctonus brevicomis and Dendroctonus ponderosae, the bark beetles affecting these pine trees. Methods/Materials The first part of the project was conducted in two locations in the San Bernardino National Forest, Barton Flats and Angelus Oaks, where a density check of two, one-acre lots was conducted at each site by counting all trees and observing which plants surrounded dead pines and which plants surrounded healthy pines. Since Black Oak trees and Manzanita bushes proved to be the most prominent plants in this region, tests were conducted to evaluate the tannin content in each plant, tannin being the most powerful acid in their leaves. The assay used was for total Phenols. First ferric chloride (FeCl ₃) was mixed with HCl to make a pale yellow solution. A separate solution of potassium ferricyanide (K ₃ Fe(CN) ₆) was diluted in water. Each substance was stabilized before mixing each leaf sample in what is called the Prussian Blue Test. Gallic acid (pure tannin) was employed to standardize the spectrometer readings. Results The survey at Barton Flats found numerous Black Oaks, yet the Ponderosa Pines still experienced high fatalities from bark beetle attacks, especially as the density of Black Oaks increased. In contrast, the survey at Angelus Oaks found greater diversity in varieties of trees, and only one fatality near the Manzanita bushes common there. Tests proved that Manzanita leaves have a tannin content of 2.5 times that found in Black Oak leaves. Conclusions/Discussion These observations led to the conclusion that Manzanita has a positive effect on Ponderosa pines by making the bark beetles' environment too acidic to be habitable, while not competing with trees for resources of water and minerals. This experiment also proved that diversity in species of trees and plants helps ensure a healthy forest, and that, in contrast, high density makes pines more vulnerable to bark beetles.	
Summary Statement This project evaluates natural methods for preventing attacks by bark beetles on pine trees and concludes that plant diversity, low density, and Manzanita are especially effective in deterring such attacks.	
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