Name(s)
Themi D. Perera

Project Number
J1611

Project Title
The Effects of Anthropogenic Environmental Disturbances on the Soil Microbial Community

Abstract

Objectives/Goals
The effects of carbon dioxide pollution, forest fires, and industrial chemical pollution on soil microbes are likely to be frequent in Southern California. To investigate whether environmental disturbances influence the productivity of microbial communities, we designed an experiment to quantify respiration (carbon dioxide output) as an indication of metabolic productivity and to measure colony forming units (CFUs) in soils from four different locations in Los Angeles, California.

Methods/Materials
Respiration measurements were executed using a Vernier CO2 gas sensor which was placed in and sealed to an open-bottomed container pushed 1 cm into the soil. Measurements were taken every minute for fifteen minutes from three sites within 1 m^2 for each location. CFUs were calculated using a dilution series in which soil samples with concentrations of 10^-4, 10^-5, 10^-6, and 10^-7 were cultured and their counts averaged.

Results
All areas displayed normal atmospheric carbon dioxide levels without significant differences between sites. Colony forming units per ml (CFUs/ml) measured 5.93 X 107, too few to count, 1.78 X 106, and 2.76 X 107, for the professionally managed, burned, desiccated, and agricultural conditions, respectively. The pH measurements of the soils were normal. Spread plates prepared using soil samples from all four sites displayed a wide variety of microbial colony morphologies, colors, and sizes, with fire-affected soils having the least diverse array of colonies.

Conclusions/Discussion
These data suggest that varying environmental disturbances have little to no effect on soil respiration levels and that professionally managed soils have the highest microbial populations per gram of soil.

Summary Statement
By measuring the metabolic productivity and diversity of the microbial population in various soils affected by anthropogenic environmental disturbances, I determined that metabolic productivity does not change but diversity varies greatly.

Help Received
Culturing the samples for calculating colony forming units was performed in the lab of Dr. Gilberto Flores, under the supervision of Tara Mahendrarajah, whom I also consulted with. Equipment was borrowed from Dr. Lawrence McKenna of Framingham State University.