Effect of Fire History on Sunflower Seedling Growth

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Introduction

Our research investigates the effects of fire exposure on soil with regard to plants and determining whether it affects their growth. We looked into POM, Particulate Organic Matter, which is soil organic matter between 0.053mm and 2 mm. POM is readily decomposable and serves many soil functions. It is a source of food or energy for soil organisms and nutrients for plants, it enhances soil structure leading to increased water filtration, aeration and resistance to erosion.This experiment could prove to be of importance to the Pepperwood community because it will help determine how long it takes for burnt soil to be fertile enough to support life. Low intensity wildfires often help clear out dense forest stands allowing the growth of new vegetation. Intensive burns can cause damage to soil properties, since soil consists of sand, silt, and clay particles, causing the loss of soil structure.

Materials & Methods

- Collected 3 soil samples at 3 different burn severity levels at Pepperwood Preserve. Dr. Kozanitas helped us find three locations at Pepperwood with the correct levels of burnt soil.
- We planted a fast-growing sunflower species *(Asteraceae)* in the different fire affected soils. We grew the plants in the on-campus greenhouse.
- We checked on the plants growth every other day and recorded any changes observed. We checked on the nitrate levels as well as the pH levels with every visit.
- We planted 3 pots in each treatment level; Low, Moderate, and High fire intensity.
- Each pot has 3-4 seeds, separate by 6 inches wide and 2 inches deep
- The materials and resources we used to conduct this research included a soil nitrate kit, a pH soil meter, a gardening shovel, and the green house provided by the Sonoma State University Campus
- We calculated means and standard errors using JMP statistical software and a model that included soil type and individual plant pot. Graphs were generated in Excel.

Figure 1: Shows the different levels of post fire soil. The low and moderate soil types were able to grow and provide nutrients for the plants. The high intensive post fire soil did not grow at all.

Results

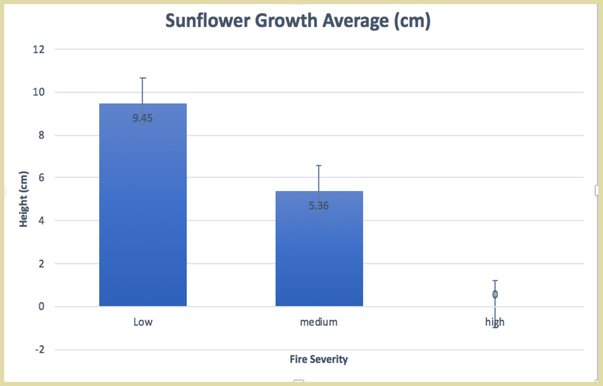

Figure 2: This graph shows the average height in centimeters in three different types of fire affected soil. The low burned soil had the best nutrients to support plant growth and the moderate burned soil had some of the seedlings sprout but not all. The highly affected soil had an absence of nutrients which, as a result, had no growth.

Figure 3: Sam and Neon working at Pepperwood Preserve at the high severity burn site at Pepperwood Preserve.

Figure 4: Neon and Luis at site #2 collecting moderate intensity fire affected soil samples.

Figure 5: Sam and Neon at the low intensity burn site collecting soil.

Discussion

Through our research we were able to find that none of the seeds germinated in the highly burned soil, some of them germinated in the moderately burned soil, and all the seeds germinated in the low burned soil and the nutrient levels in each type of soil differed with the highly burned soil having the lowest levels. Even though a whole year has passed since the fire, the highly burned soil still isn't fertile enough to support plant growth yet. Through having these results community partners such as Pepperwood Preserve who have been affected by fires or are at risk of fires in the future can use our research in restoration of burned areas. By knowing the soil environment (levels of nutrients contained in the soil like nitrate and phosphorus) in which vegetation such as sunflower shoots strive, in fire affected soil, they can know when it is the right time to start the restoration process. In some instances, you will have to wait a year or longer.

References

González-Pérez, J. A., González-Vila, F. J., Almendros, G., & Knicker, H. (2004). The effect of fire on soil organic matter—a review. *Environment international*, *30*(6), 855-870.

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