# The Mysterious Green Patch: Effects of Soil Characteristics on Plant Diversity in Long Valley

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## Introduction

• Our research site was a mysterious green patch surrounded by dry plants. We wanted to know why.

• Our testable question asks **"How do soil characteristics affect plant abundance and diversity in Long Valley?"**

• We hypothesized this change in vegetation was caused by a higher concentration of nutrients (NPK-nitrogen, phosphorus, and potassium) closer to the green patch.

• After doing research, we believed that the differences in vegetation were caused by an alluvial fan.

• Some erosion events result in alluvial fans that deposit sediment and other particles in a fan shape, which happen around valley-like areas (Figure 1).

## Methods

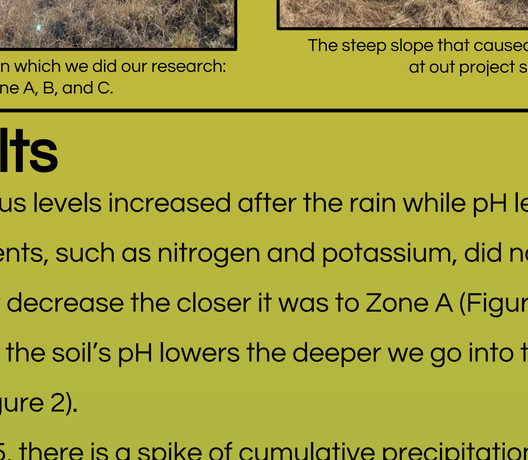
• We set out two 60-foot transects in the middle of a green patch (Zone A) out towards dry plants (Zone C) with another zone between these two (Zone B).

• We used an auger to collect soil samples at 10, 30, and 60 cm. deep. We took samples twice, before and after rain.

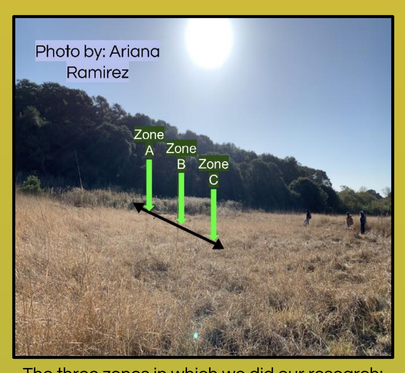
•The samples were tested, using GLOBE protocols, to measure the nutrients nitrogen, phosphorus, and potassium (NPK) and pH, using a LaMotte soil testing kit.

•We followed the GLOBE Characterization protocol to analyze a soil profile in Site A and Site C.

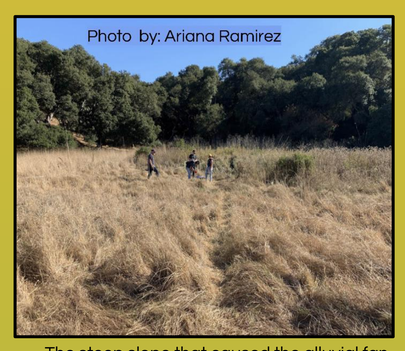
• Along the second transect, which was 5 feet parallel to the one for soil testing, we set down 5 quadrats (one at each end of the transect, the others randomly) to look at the abundance of plant species in Zone A, B, and C.




Group picture of the Groots (from left to right)
Ariana Ramirez, Ashley Rubio, Juliana Arrona, Ann Braak




The three zones in which we did our research: Zone A, B, and C.




The steep slope that caused the alluvial fan at out project site.

## Results

• Phosphorus levels increased after the rain while pH levels and other nutrients, such as nitrogen and potassium, did not increase or decrease the closer it was to Zone A (Figures 2-4).

• In Zone A, the soil's pH lowers the deeper we go into the ground (Figure 2).

• In Figure 5, there is a spike of cumulative precipitation. This means that the soil was more saturated and the water table was also higher.

• Figure 6 shows us that the color, structure, consistency, and texture of soils in Zones A and C greatly differ.

• The soil in Zones A and C are visually different, Zone A has a layer of lighter, sandier soil at the top (Figure 7).

• In Figures 8-10, we can note that the diversity of plants increases as you get closer to the green patch (Zone A).

## Discussion

• We partly answered our testable question.

• NPK levels, which did not differ enough to explain the presence of the green patch, were altered after the rainfall.

• After analyzing aerial images and rainfall data, we can infer that the alluvial fan formed February 2017, where the green patch is today (Figure 11).

• The formation of alluvial fans can affect the soil and vegetation of an area which can affect an entire ecosystem. This can be seen in a previous study where alluvial fan formation promoted the spread of arroyo willow. (Source 2)

• The top three horizons of Zone A indicate a different soil that was almost certainly caused by the alluvial fan. After the third horizon of Zone A, it begins to look like Zone C starting from 0 cm (Figure 7).

• Our project can tie into climate change because it causes extreme weather events, like severe rainfall, which could have caused the formation of the alluvial fan.

• This project might raise questions about how alluvial fans affect an area or if climate change was responsible for its formation.

• Given more time, we would identify the plant species, possibly found another alluvial fan, and we may have had the chance to compare both of them to see if there were any trends in vegetation or nutrients.

• Our project might be of importance to multiple agencies looking for places to construct a pond at Elkhorn Slough or any organization interested in alluvial fan formations.

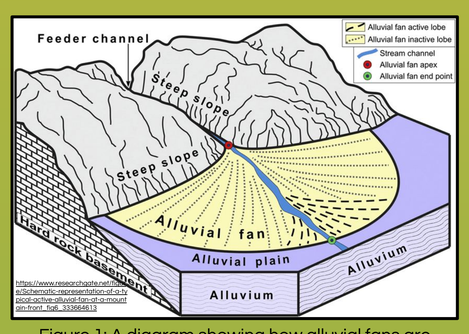



Figure 1: A diagram showing how alluvial fans are formed.


Figure 11: Aerial image of our site before and after the alluvial fan.

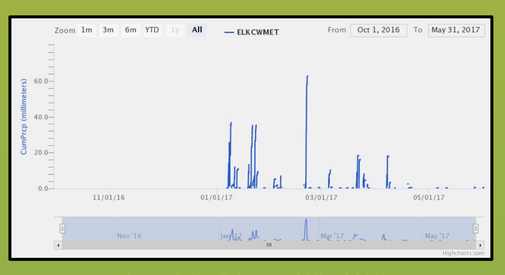
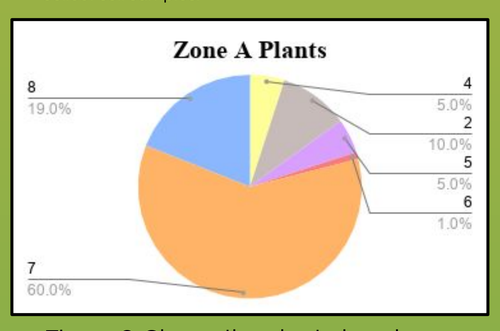



Figure 5: On February 20th of 2017, there is the tallest spike in cumulative precipitation.


Figure 7: A comparison of the horizons of 0-100 cm in Zones A and C

| Date | Site | Horizon | Top (cm) | Bottom (cm) | Roots | Rocks | Structure | Color | Consistency | Texture | Carb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/13/19 | Zone A | 1 | 0 | 20 | Few | None | Granular | 10YR 4/4 | Loose | Sand | None |
| 12/13/19 | Zone C | 1 | 0 | 14 | Few | None | Blocky | 10YR 3/3 | Firm | Loamy-sand | None |

Figure 6: Soil quality differences we found in the first horizons in both Zone A and C (See figure 7 for the rest of the horizons)




Ashley using the auger to collect soil samples.


The Groots looking at plant abundance and diversity within the quadrat.




Figure 8: Shows the plant abundance and diversity in Zone A.

Species 7

Most abundant plant in Zone A

| conversion table | |
|---|---|
| very high | 8 |
| high | 7 |
| medium high | 6 |
| medium | 5 |
| medium-low | 4 |
| low | 3 |
| trace | 1 |
| less than trace | 0.5 |
| no trace | 0 |

Nutrient conversion table for y-axis of nutrient graphs.

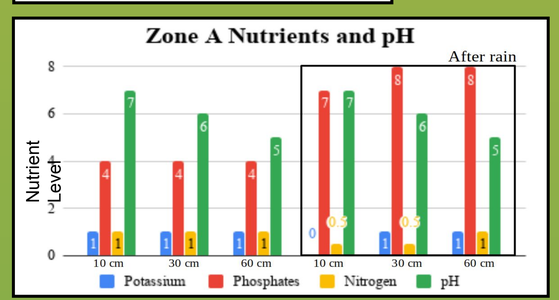



Figure 2: The NPK and pH levels in Zone A before and after the rains.

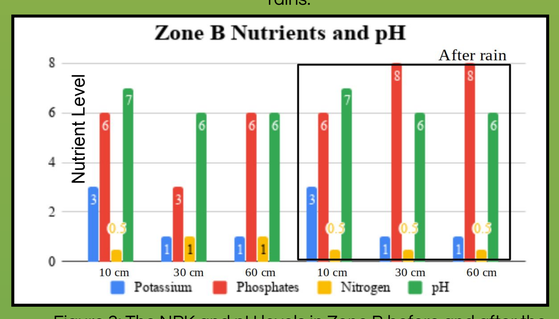



Figure 3: The NPK and pH levels in Zone B before and after the rains.

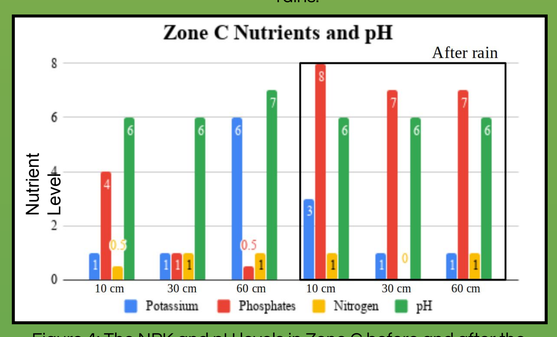



Figure 4: The NPK and pH levels in Zone C before and after the rains.

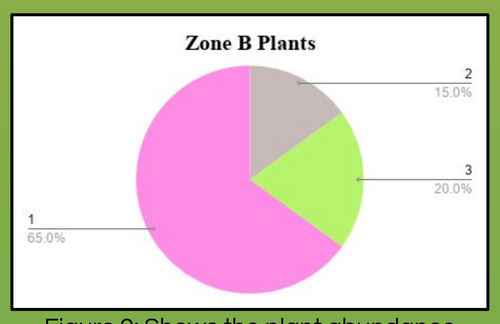



Figure 9: Shows the plant abundance and diversity in Zone B.

Species 1

Most abundant plant in Zone B

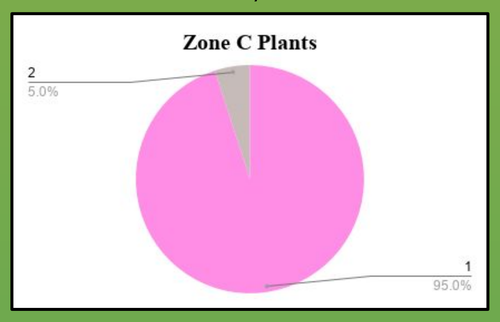



Figure 10: Shows the plant abundance and diversity in Zone C.

Species 1

Most abundant plant in Zone C

## Literature Cited

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