



# Microbes, Microenvironments, and Plants. Oh My!

Mrs. Cooper's 5<sup>th</sup> Grade Class

Mill Creek Elementary School



## Introduction

For our mini-grant project we decided to learn about the different microenvironments in our outdoor classroom. We decided to do this because we wanted to see what makes the microenvironments in our outdoor classroom different. We also did this because it would teach us how to make a grant, what different microbes affect plants, and what microbes look like through a microscope. In our first experiment we searched for different microbes and tried to count them. We also had an experiment to see how well plants grew in the different soils we collected. The two plants we used were *Medicago truncatula* and *Arabidopsis thaliana*. We collected data on each plant like how fast they germinated, how tall they grew, or how many leaves they had to see how well they grew in the different soils. Our last experiment was to find out what nutrients were in the different soils. We put our results together in this poster.

## Goals

- To learn what makes the microenvironments in our outdoor classroom different
- Count the microbes from the different microenvironments
- Discover what kinds of different microbes we find from each microenvironment
- See how well plants grow in the soil from the different microenvironments
- Learn what nutrients are in the soils from the different microenvironments

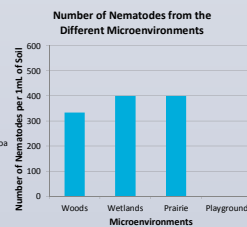
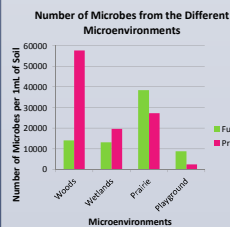
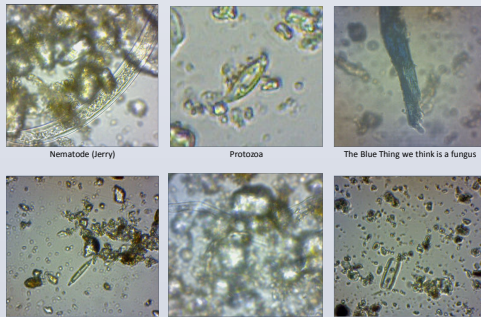
## Microscope Experiments

### Methods

We collected some soil from each of the four microenvironments in our outdoor classroom. We mixed 1 tablespoon of soil with 9 tablespoons of warm water and stirred it for a minute. We used a dropper to get some of the liquid and counted to ten to let the microbes fall to the bottom. Then we put one drop on our slide and covered it with a glass coverslip. To count the microbes, we looked at twenty spots on a slide and averaged the numbers. We multiplied the average by 4000, because that's how many spots are on a slide at a 100x magnification. Then, we multiplied by 10 because there was 1 part soil and 9 parts water and that is 1/10.

### Results

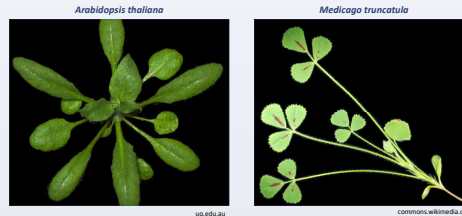
Using the microscopes we could see the size, shape, and color of the microbes. We could tell the different microbes apart by looking at them. There were lots of organisms such as nematodes, protozoa, and fungi. The woods had a lot of protozoa, and the prairie had a lot of fungi. The playground didn't have much of anything.



## Plant Growth Experiments

### Plants We Grew

The two plants we used were *Medicago truncatula* and *Arabidopsis thaliana*. We used these plants because they are model organisms. Model organisms are organisms that are close relatives to things we care about, and they are easy to study. We chose these plants because they are small and grow fast. Also, *Medicago* can have relationships with different microbes.



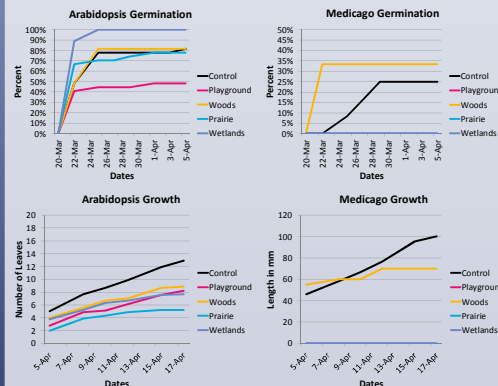
### Methods

We collected soil from 9 spots on each microenvironment shown on the map below. Next, we mixed up the soil, added a little bit of water, and put it in the pots. We made 3 *Arabidopsis* pots with soil from each area. We also had 3 control pots made with potting mix. Also, we made 1 *Medicago* pot with soil from each area and 4 control pots with potting mix. We put 3 seeds in the *Medicago* pots and 9 seeds in the *Arabidopsis* pots with some sand to help spread them out. To find our percent, we counted how many seedlings we saw each day and divided by 9 for *Arabidopsis* and 3 for *Medicago*. To see how well *Arabidopsis* grew each day, we counted the leaves. For *Medicago*, we measured the length to see how well the plants grew.



### Results

The best soils for the seeds to germinate were the wetlands, woods, and the control soil for *Arabidopsis*. For *Medicago*, the seeds on the soil from the woods did the best, the seeds on the prairie, playground, and wetlands soil didn't sprout. The best soil for the plants to grow was the control soil for both *Arabidopsis* and *Medicago*. The prairie soil was the worst for growing *Arabidopsis*.



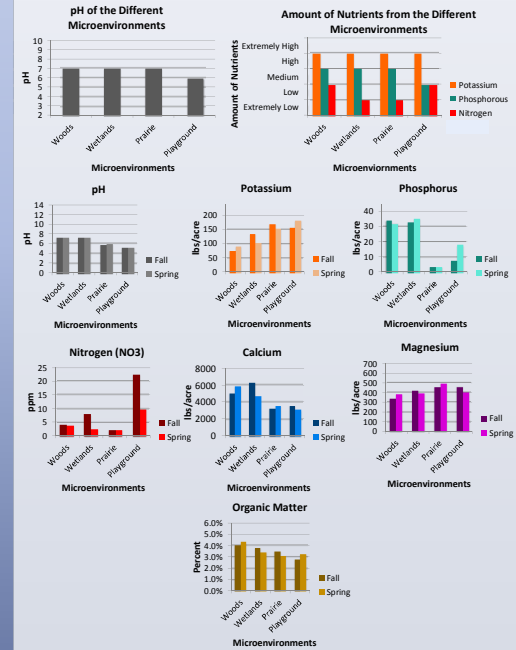
## Nutrient Experiments

### Methods

We started by collecting soil from our outdoor classroom from the spots on the map. Next, we mused the soil together. We took little pieces and crushed them up and let them dry overnight. Then, we mixed the soil with water and followed the directions on the Mosser Lee Soil Master Soil Testing Kit. We collected the soil the same way and also sent it to the MU soil testing lab.

### Results

Overall, we think the woods and the wetlands have the most nutrients and the prairie and playground have the least. The woods and the wetlands had the most phosphorus, calcium, and organic matter in the spring and the fall. The prairie and playground had the least. The prairie and the playground only had the most potassium. The prairie had the most magnesium and the playground had the most nitrogen. The only big differences between fall and spring were for nitrogen on the playground and the wetlands, and calcium on the wetlands and the woods.



### Conclusions

- The Microenvironments are different in lots of ways like the amounts of nutrients, the microbes that live there, and the plants that grow there.
- The woods was the best place for plants and the playground and the prairie were the worst. This makes sense because there are more plants in the woods and less in the prairie and the playground.
- Microbes help plants because there are more microbes in the woods and our plants grew better in the woods.
- Plants grow better with more nutrients because in the woods and wetlands there were more nutrients and plants grew better there than in soil where there were less nutrients.

### Acknowledgements

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- Show Me Nature GK-12
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