Prospect Park: Relationships between soils and trees

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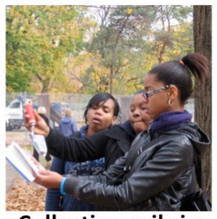
Abstract

Prospect Park is home to the last remaining natural forest in Brooklyn. Along with the watercourse, the diversity of trees hosts a wide range of animal species. However, not many of us take the time to consider the deterioration of these trees' health, in terms of the soil composition, and how they affect the overall surroundings. This project looks at types of nutrients (nitrogen, phosphorus, and potassium) and pH that have a great impact on the soil where the trees are located, as well as the soil in normal open areas, in order to clarify a solid comparison between the different locations and helps us to determine which conditions are the best for the improvement of the trees. The soil samples were collected by several groups of students from various locations in the southeast corner of Prospect Park and were brought to the lab for testing the nutrients.

Methods

During our research at Prospect Park we analyzed soil. While in the park we pick up a handful of soil. Soil is usually composed of clay and sand. If it is moist and dark in color and does not fall through your fingers easily, then it most likely has a good balance between the clay and sand. We recorded the status and data of the collected soil then made proper observations before collecting samples to experiment on during class. The characteristics of the soil are very important because it determines the category the soil was placed in. Once we got back into the classroom to continue working with the soil samples, the next objective was to test the soil's pH and nutrient values.



Collecting soils in Prospect Park.

Analyzing soil in the lab.

The first step in doing so was sifting the soil to get a pure and clean portion of the sample to work with. Next, we put the soil in the microwave for about 1 minute. This was to dry the soil. We then put a little bit of the soil in a beaker with some water and stirred it with a spoon for about 5 minutes. After that, we let the mixture settle for about 5 minutes more in order for the soil to settle to the bottom, leaving a clear supernatant at the surface. Using three separate test tubes, we filled each with the supernatant. In each water sample, we dropped a tablet in, one to test for nitrogen, the other for potassium, and the last for phosphorous. We dissolved the tablets by shaking the tubes. After, we used the color chart to see if the color of the solutions had any matches on the chart. We used the same supernatant to test for pH using litmus paper. Lastly, we recorded the results of pH value and the value of the nutrients and concluded our experiment.

Data

sample #	collection date	latitude	longitude	depth	temp	moisture	structure	color	consistence	texture	rocks	roots	pH	nitrogen	potassium	phosphate
B2-101609.1	11/16/09	40.39.17N	73.57.50W	top soil	12		blocky granular	10YR 2/1	firm	loamy sand	none	few	5	high	medium	medium
B1-111609.3	11/16/09	40.65.583N	73.96.407W		10	dry	granular	2.5YR 3/2	firm	loamy sand	none	few		low	low	high
B2-121509.1	12/15/09	40.39.310N	73.57.836W	17cm	48	moist	granular	7.5YR 2.5/1	firm	blocky	none	many	4	low	medium	high
B1-110509.1	11/5/09	40.30.387N	73.57.808W	top soil	43	moist	granular	10YR 2/2	friable	loamy sand	none	many	5	low	medium	none
B1-110509.2	11/5/09	40.30.357N	73.51.808W	top soil	43	moist	granular	10YR 2/2	friable	loamy sand	none	many	6	low	none	low
B1-121509.1	12/15/09	40.39.385N	73.51.815W	3in	60	wet	granular	7.5YR 2.5/2	friable	loamy clay	many	few	5	low	high	none
B5.111709.1	11/17/09	40.65.594N	75.963.86W	top soil	14	moist	granular		loose	sandy clay	many	few	8	none	medium	high
B5.111709.2	11/17/09	46.65.552N	73.96.390W	top soil	13	moist			firm	sandy clay	many	few	6	med	none	high
B3-110509.1	11/5/09	40.39.23N	73.57.50W	top soil	15	dry	blocky	SG 4/2	firm	sand	none	many	7	none	medium	high
B3-110509.2	11/5/09	40.39.390N	73.57.823W	top soil		dry	granular	7.5YR 2.5/3	friable	loamy sand	none	many	6	low	medium	medium
B3-121509.3	12/15/09	40.39.389N	73.57.345W	6in	9	moist	granular	7.5YR 2.5/1	firm	sand	many	none	5	low	medium	none
B4-101309.1	10/13/09	40.39.325N	73.37.833W	top soil	12	dry	single grained	10YR 4/3	friable	loamy sand	few	few	5	low	low	low
B4-111609.2	10/13/09	40.39.325N	73.37.833W	top soil	17	moist	granular	2.5Y 3/2	friable	loam	few	few	5	low	low	none
B4-121509.3	12/15/09	40.39.318N	73.57.829W	15.5cm	9	dap	granular	2.5Y 3/2	friable	clay	yes	yes	4	none	low	low
W3-101509.1	10/13/09	40.39.37N	73.57.829W	top soil		moist	granular	2.5Y 4.2	friable	loamy	few	few	5	low	medium	low
W5-101509.1	10/15/09	40.39.392N	73.57.848W	20.5cm	50	moist	granular	10YR 2/1	friable	loamy sand	none	many		low	low	high
W4-110609.1	11/15/09	40.34.39N	73.57.797W	top soil	11	dry	granular		loose	sand clay loam	few	many	5	low	high	medium
W3-101509.1	10/15/09	40.39.37N	73.57.829W	top soil		moist	granular	2.5Y 4/2	friable	loamy	few	few	5	low	medium	low
W3-100809.1	10/8/09	40.39.22N	73.57.049W	top soil	15	dry	granular	2.5Y 3/2	friable	loamy sand	few	many	7	low	low	high
W2-111509.1	11/15/09	40.39.31N	73.57.47W		12		granular	10YR 2/1		silty clay				low	medium	high
W2-121509.2	12/15/09	40.39.367N	73.57.798W	8.5in	7	dry	granular	2.5Y 3/2		granular		few	7	low	low	high
W1-110509.1	11/5/09	40.39.132N	73.57.456	top soil	15	moist	granular	7.5YR 2/5	friable	clay loam	few	many	6	low	medium	high
W1-121509.1	12/15/09	40.39.368N	73.57.840W	15.7cm	10			10YR 4/2		solly sandy clay	few	few		low	low	high
W4-110509.1	11/5/09	40.39.381N	73.57.797W	top soil	11	dry	granular		friable	loamy sand	few	many	5	low	high	medium
B2-111609.2	11/16/09	40.94.655N	73.963.56W	top soil		moist	granular		loose	sandy clay loam	many	few	7	low	medium	high
W4-121509.1	12/15/09	40.39.380N	73.57.749W	12cm	10	moist	granular			loamy sand	few	many	7	low	high	low

History of Prospect Park

Prospect Park is a man-made park that was built the 1860s, and since then has been a place that provided for a large and fast growing population.

- **In 1776,before the park was built, the park's land was the location for the Revolutionary War's Battle of Long Island.**
- **Robert Fulton's steam ferry transformed Brooklyn into the world's first commuter suburb in 1814. Immigrants began to move in, which meant more transportation, which damaged the rural landscape. During this time, new concepts of the potential role of public parks in America were gaining popularity and concerns.**
- **Frederick Law Olmsted, Calvert Vaux, Egbert L. Viele submitted the comprehensive plan for the development of Brooklyn's premier park in 1866.**

Results

The collection area of Prospect Park has moderately high potassium rates which could mean that there are a lot of potassium rich minerals such as micas or that the soil is fertilized regularly with potassium rich fertilizers.

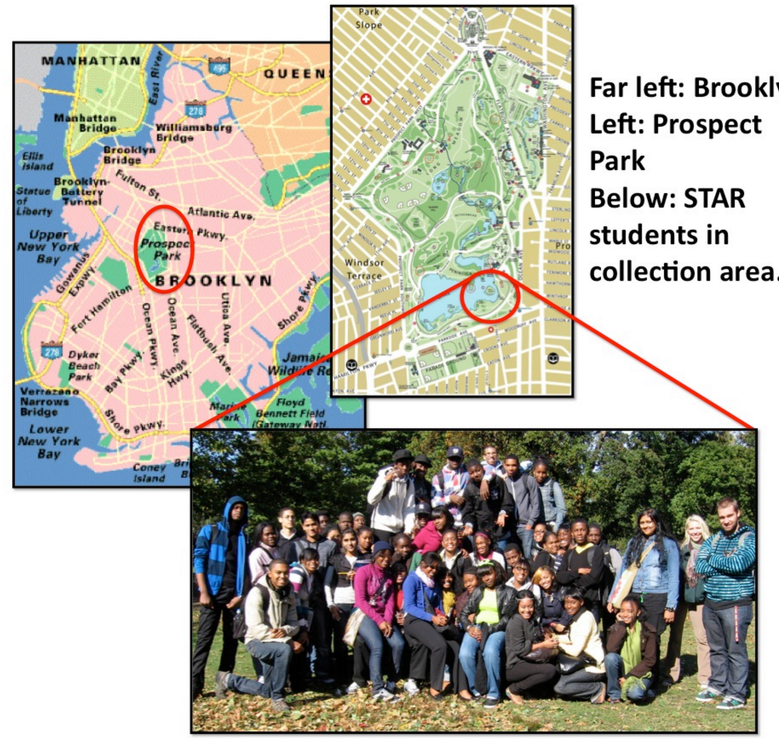
Nitrogen levels, on the other hand, were extremely low because nitrate is negatively charged and is often taken up by trees and washed away.

Phosphate levels were mostly high but this result correlates directly with pH level—if pH is less than 5 or greater than 8, phosphates become harder for tree's to use due to the fact that they may combine with other elements in the soil.

Nutrient levels
- low
- medium
- high

Tree Species
- native
- invasive

Invasive and native tree species showed no major difference in effect on soils, which may be due to the woodchip compost that is used on the trees. Previous studies found that woodchips did not affect nutrient availability during their first two years of use, but after the third year they started to reduce vegetation cover and native species richness, which could have happened in this case. Nutrient concentration underneath trees was lower than it was out in the open, which means that trees are using nutrients adequately.



Far left: Brooklyn
Left: Prospect Park
Below: STAR students in collection area.

Conclusion

Based on the resulting data, it can be concluded that the trees around the tested area of Prospect Park have different amounts of intake of potassium, nitrogen, and phosphate. For example, the soil samples taken around trees have very low nitrogen levels. So, the intakes of potassium and phosphate will be higher around this area. The soil samples were taken in the inlands of Prospect Park; the nitrogen levels were increasing lower as we moved away from the lake. The potassium levels weren't as low or high but as we moved inland, the level became really low. The phosphate levels around the lake were very high but as we moved inland, it was still higher. This is probably caused by soil elements interacting, and the pH level near lakes is probably very high. Possibly, there might be interference between the lake and trees consumption of nutrients. We have starting testing the lake water in Prospect Park but there isn't much data to conclude that there really is unequal consumption of potassium, phosphate, and nitrogen between the lake and trees. The topography is probably one of the reasons why these levels are so high because there might be a high and low land level. This can cause the rates of the elements to drain to certain to areas where is it collected and consumed more or less based on the needs of the trees. Also due to surface runoff, the amounts of nitrogen, potassium, and phosphate might have been washed away from the areas where samples were taken.

Acknowledgements

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