Forest Succession Lab Report

The study of trees has the potential to greatly impact knowledge of past conditions as well as trends for the future. For example scientists in the field of dendrochronology, the study of tree rings, can learn about climate, ecology, environmental disasters, glaciers, wildfires, and insect populations by evaluating the size and other characteristics of the rings. It is crucial for human beings to monitor activities that affect trees, especially forests, because it takes a long time for a forest to recover once it has been clear-cut or burned out in a wildfire. Many people do not understand the importance of trees, both to the ecology and to human knowledge. This field study was conducted to increase students' awareness of tree characteristics, introduce them to dendrochronology, and monitor the trees of the UTM forest, in a given transect.

Methodology

Materials needed for this study included DBH (diameter at breast height) measuring tapes, 30 m measuring tapes, clinometers (for measuring angles), increment borers (to extract samples from trees), measuring tape, meter stick, probe thermometers, soil core extractors, soil evaluation guide, magnifying loupes, 0.5 mm rulers, field notebooks, pens, and calculators.

Students worked in groups at an assigned transect. First, general information about the trees in the transect was recorded in the field notebook: diameter, type (coniferous or deciduous), tree heights, and average canopy height. The clinometer was used to measure angles, and height was calculated using the following formula: $h_{object} = h_{observer} + d_{object} * \tan a$

Next, students located two coniferous trees with approximately the same diameter, one which was dominant and another which was non-dominant. The dominant tree had favorable conditions for growth (i.e., even ground and no obstruction of sunlight). The non-dominant tree had one or more of the following conditions: limited access to light, steep slope location, noticeable dead branches, or located in a low spot where water could pool.

A 10 cm core sample was taken from each tree. The core, which showed a small portion of each ring it passed through, was examined under magnification and the width of each ring was measured. Other patterns in growth were noted, because they could give important clues to conditions at the time the ring was formed.

Third, soil cores were taken from the four quadrants at distances of 4 m each from the plot. The soil samples were characterized based on the soil texture guide. Temperature was also recorded for each sample site.

Results

Table 1: Diameter and Type of Trees

Table 1:	Tree Diameter	Tree Type
1.	11 cm	Coniferous
2.	55 cm	Deciduous
3.	31 cm	Deciduous
4.	14 cm	Deciduous
5.	12 cm	Deciduous
6.	14 cm	Deciduous
7.	13 cm	Deciduous
8.	11 cm	Deciduous
9.	15 cm	Deciduous
10.	15 cm	Deciduous
11.	10.5 cm	Deciduous
12.	44 cm	Deciduous

Table 2: Diameter Distribution of Trees at UTM Forest

Diameter Class	Proportion of Trees Surveyed
10 - 19.9cm	75% (9)
20 - 29.9cm	0% (0)
30 - 39.9cm	0.08% (1)
40 - 49.9cm	0.08% (1)
> 49.9 cm	0.08% (1)

Since 75% of the trees measured were less than 20 cm in diameter, this appears to be a relatively new growth area of the forest.

Table 3: Height of Trees

Height of person = 160cm	Angle	Distance	Tree Height
Tree 1.	80	5 m	37 m
Tree 2.	70	5 m	18 m
Tree 3.	85	5 m	75 m
Tree 4.	75	5 m	24 m
Tree 5.	85	5 m	75 m
Tree 6.	60	5 m	11 m

According to these measurements, the average height of the canopy is 40 m. Since it was stated to be 24 m, there may be errors in measurement and/or calculations.

Table 4: Measurement of Rings from Core Samples

	Tree 1.	Tree 2.
Diameter	58 cm	51 cm
Ring 1	1.5 mm	2 mm
Ring 2	3 mm	2.5 mm
Ring 3	2 mm	3 mm
Ring 4	1.5 mm	2.5 mm
Ring 5	2.5 mm	2.5 mm
Ring 6	2 mm	3 mm
Ring 7	1.5 mm	1.5 mm
Ring 8	1 mm	2 mm
Ring 9	1 mm	1.5 mm
Ring 10	1 mm	2 mm
Ring 11	0.5 mm	1 mm
Ring 12	1 mm	1 mm
Ring 13	0.5 mm	0.5 mm
Ring 14	0.5 mm	0.5 mm
Ring 15	1 mm	0.5 mm
Ring 16	0.5 mm	1 mm
Ring 17	0.5 mm	1 mm
Ring 18	0.5 mm	0.5 mm
Ring 19	1 mm	0.5 mm
Ring 20	1 mm	0.5 mm

Tree 1, with a diameter of 58 cm, had little available light, while tree 2, with a diameter of 51 cm, had more light. In 10 of the 20 rings, tree 2 was wider than tree 1; in another 6, the rings appeared to be equal. In only 4 rings did the width for tree 1 exceed the width for tree 2.

Table 5: Soil Profiles

Location	Soil Profile	Temperature
West	• 0-60 mm , more bark, coarse sand • 60-120 mm Fine sand • 120-190 mm very fine sand • 190-240 mm silt & Clay	13.5 degrees Celsius
South	• 1-40 mm, white stuff, darker fine sand • 40-90 mm, lighter	13 degrees Celsius

	fine sand • 90-130 mm mix silt, clay sand • 130-190 mm silt & clay	
North	• 1-40 mm, dry and has lots of decomposed fragment of leaves and twigs. • 40-80 mm, Sticky and soft • 80-120 mm, harder in density as well as significantly lighter in colour (dark orange)	13.2 degrees Celsius
East	• 0-50 mm, dark and moist and contains small white soil. • 50-130 mm, silt & clay	13.4 degrees Celsius

Discussion

Three distinct areas were noted in the transect. One was a coniferous field artificially planted; as a result, it was not staged. There were many trees but few birds. Succession would start once the planted trees died or were cut down.

The second area was an old field with early stage succession occurring. Finally, the portion that was old growth forest had birds and more broad-leaf trees. The overall variety of species was characteristic of the mature stage of succession. Evidence of some clear cut areas was noted. There was also one outlier, a large coniferous tree surrounded by young deciduous trees. The soil temperature in this area was dependent largely on the amount of sunlight received,

Almost all of the trees whose diameters were measured were deciduous, primarily with diameters under 20 cm, indicating an early stage. The core samples taken from the two coniferous trees clearly exemplified the effects of optimum conditions, specifically sunlight.

Although the tree that received more light had a slightly smaller diameter, its growth rate was faster than that of the tree that received less light, suggesting that it was younger. If it contains to be in favorable conditions, it will soon surpass the older tree. However, even the younger tree gave evidence of some years in which it did not grow quickly, possibly due to lower than normal temperatures or higher than normal cloudiness and rainfall.

It was surprising that the 4 soil samples had such different characteristics, although they were not very far apart. The North and East samples, which had decomposing leaves and vegetation at the top, were likely to be richer in nutrients than the sandy or clay soils. On the other hand, sandy soil can be easier for new plants to break through, as well as providing better drainage.

Conclusion

This activity made the concepts of tree characteristics more meaningful, as well as illustrating what trees can tell us about the past and present environment. It would be interesting to learn more about the climate and other factors in the past 20 years, in order to further interpret the core samples taken from the two coniferous trees.