Trees cover us

GLOBE		Associated SDG	Type of Activity
Sphere	**Protocols**		
Biosphere	Biometry Land Cover Classification Tree Height	15: Life on Land 13: Climate Action	Research
Atmosphere	Air temperature Surface Temperature Precipitation		

Overview

When studying vegetation, one of the most important measurements made in the field is plant cover, as this is a good indicator of the abundance of species in a given location. This activity aims to investigate tree cover at a site selected by students and teachers.

Time

50 minutes

Prerequisites

- To know the Pythagorean Theorem
- To know how to calculate percentages
- To identify the cardinal points with and without a compass.
- To know how to use the densiometer
- To know the distance of your steps (not essential)

School Level

- Secondary

Purpose

Students will determine the percentage of an area that is covered by trees and identify the dominant tree species in a 10m X 10m square plot.

Student Outcomes

- Students will delimit a square of an area of 10m X 10m in their study site, using their own steps and will draw two diagonals in a NE-SW and NW-SE direction.
- Students will calculate the distance of the diagonals of the square they drew using the Pythagorean Theorem.
- Students will use a densiometer to record tree cover at the established study site.

Background

Canopy cover is defined as the percentage of the sampled area that is covered by the vertical projection of trees. This measure is very important because trees influence many ecosystem processes. For example, they are involved in the regulation of light, temperature and the percentage of rainfall reaching the ground. They are also involved in carbon capture, oxygen release and the provision of habitats for many other species, such as birds. For example, it has been studied that a larger tree canopy causes changes in the light and precipitation received on the ground. The latter, in turn, affects the availability of water in the soil. The canopy and branch structure channel rainfall and create drip points that can cause more intensity of local effective precipitation (Suqui et al., 2021).

reducing noise in cities as well as urban heat island effects (Newete et al., 2022). Therefore, it is important to have adequate tree cover in our cities and fields, as well as to recognize which trees are most common in our environments.

Tree canopy cover can be assessed in terms of the number of times a person can find the tree canopy in a given area. This is also called density, so the instrument that helps assess tree canopy cover, or canopy, is called a densiometer. With this activity a simple version of a densiometer will be used to assess tree canopy density and, therefore, infer tree canopy cover.

Scientific Concepts

- Canopy
- Cover
- Density
- Dominance
- Biodiversity

Guiding Research Questions

- What is the tree cover we have near the school?
- What is the dominant tree in our study site?
- What is the relationship between cover and precipitation?
- What is the relationship between temperature and tree cover?
- Does tree cover change throughout the year?
- At what time of the year is tree cover the highest?
- What animals species use trees to live?

Materials and Tools

- Densiometer
- 50 m tape measure
- Calculator
- Paper
- Pencil

What to Do and How to Do It

- ***Beginning***
    - Students draw or take pictures of trees they can find near their school and share any information they have about them.

- Teachers help students identify the canopy of trees they have drawn or photographed.
- The students choose the tree with the largest canopy and the tree with the smallest canopy and infer about the effects of canopy cover on the soil, aided by the following questions:
    - Which of the trees provides the most shade, and why?
    - Which of the trees is best to protect us from the rain? Why?
    - Where could we find more birds? Why?

- ***Development***
    - The students visit the nearest place where they can find trees and in groups of 4 they draw a square of 10m x 10m. Then, they stand in the middle of that square and locate the cardinal points, drawing two diagonals in a NE-SW and NW-SE direction covering the whole area.
    - Using the Pythagorean Theorem, the students calculate the distance of the diagonals in meters.
    - In teams of two, the students go to the south end of the square.
    - Using the densiometer the students observe the canopy cover along each of the diagonals by following the steps below:
        - They point the densiometer vertically towards the canopy cover (see activity of construction and use of the densiometer).
        - Every two steps one (a) of the students observes the canopy cover, while his/her partner (b) writes down the data on a sheet of paper. If cover is observed through the densiometer, a plus sign (+) is placed on a sheet of paper.
        - If the result of the cover observation is positive, i.e. there are trees, the name of the species is noted. If they do not know the tree, it is recommended that they take a photograph and then ask an expert to help determine the name of the species. They need to make sure that the photograph shows the branches and flowers, if there are any. The fruits and bark also help in determining the species.
        - The students follow the same procedure along the two diagonals drawn.
        - At the end the total number of observation points is added up (remember it is every two normal steps).
        - The number of points where tree canopies were found is added up.
        - The total number of points where there was tree cover by species is added up.
    - Repetitions are always important for science so it is necessary that each square is evaluated at least 3 times.

- ***Closing***
    - Using a calculator, the students calculate the percentage of canopy cover in the square. For more detail on the percentage calculation, see the "Cover: The Value of Percentages" activity.
    - Based on the results, the students discuss which diagonal has the most cover.

- The dominant species is identified (the one with the most positive observations in the square).
- The students discuss what the effect is of having more or less cover.
- A decision is made as to whether or not more trees are needed on the investigated site and a discussion is held on how this cover can be improved.
- Further research is proposed. This may relate cover to the amount of precipitation received, the amount of light or temperature, for example.

Frequently Asked Questions

Can I work on squares smaller than 10m x 10m?
Of course, they can be 5m x 5m squares if it is in a small area. In this case, only two students per square will be enough to do the work.

What if I don't have fields near the school, can I still apply this activity?
You could work with a satellite image and points every 0.5 cm, and still have your students calculate percentages of plant cover and find out which areas of your city have the most plant cover.

Resources

Application of the GLOBE program to measure tree height: *https://bit.ly/3QA3kiJ*
Guide for using the application to measure tree height:
https://bit.ly/3Bx3IdB

Bibliography

Newete, S.W., Abutaleb, K.Byrne, M.J. 2022. Mapping the distribution and tree canopy cover of *Jacaranda mimosifolia* and Platanus × acerifolia in Johannesburg's urban forest. Science Reports 12, 5998. https://doi.org/10.1038/s41598-022-09780-y

Suqui, A., Célleri, R., Crespo, P., et al., 2021. Interactions between leaf area index, canopy density and effective precipitation of a Polylepis reticulata forest located in a páramo ecosystem. LA GRANJA: Revista de Ciencias de la Vida 34(2) 2021:63-79 https://doi.org/10.17163/lgr.n34.2021.04