Measuring Canopy Cover
Teacher Instructions

Introduction:

Canopy cover plays a great role in the amount of sunlight that reaches the forest floor. Scientists classify forest canopies as open (10-39% of the sky is obstructed by tree canopies), moderately closed (40-69% of the sky is obstructed by tree canopies) or closed (70-100% of the sky is obstructed by tree canopies).

A densiometer is used to measure the amount of light that penetrates the forest canopy. Several types of densiometers exist. A simple densiometer is a device with a mirror apparatus inside that reflects the canopy above. It works somewhat like a periscope. The viewer sees a mirror image above, which allows him/her to estimate how much of the sky above is blocked by tree canopies.

If densiometers are not readily available there is an alternative method. A cheaper method is to use canopy cover grid. Your students will be using either a densiometer or a canopy cover grid (provided below) to estimate the percentage of canopy cover.

Objectives:

1) Select the site where the protocol will be conducted.
2) Conduct the protocol.
3) Calculate the percent of canopy cover.

Students Required: Partners (or larger groups if materials are limited)

Estimated Time: 1 - 55 minute period

Overview of Tasks:

1) Previous to doing this activity, students should have selected and marked their team's study sub-plots.
2) If using alternative method, provide enough copies of the canopy cover grids and data sheets.
3) Set out all of the necessary materials for the protocols.
4) Using your site maps, have students select 3 plots for sampling.
5) Partner your students and review the student protocol with the class.
6) Allow the students to conduct the protocol, making sure that they use the protocol that correlates with the available supplies (method A uses the standard densiometer, method B uses the homemade densiometer).
7) Allow the students to share data that was taken form the same site to get a better estimate of canopy cover (Class Collection Data Sheet).
8) Have the students write a lab report using whatever method works best in your class.

Measuring Canopy Cover
Student Instructions

Instructions:
Canopy cover plays a great role in the amount of sunlight that reaches the forest floor. When a large amount of sunlight is allowed to penetrate areas of the canopy, a dense understory can develop. A heavy or dense canopy results in a small amount of available sunlight that reaches the forest floor, and subsequently a sparse understory. In addition, mortality of tree branches ("self pruning"), individual trees (self-thinning) or whole species occur after canopy closure because of light limitations to growth and photosynthesis. Scientists classify forest canopies as open (10-39% of the sky is obstructed by tree canopies), moderately closed (40-69% of the sky is obstructed by tree canopies) or closed (70-100% of the sky is obstructed by tree canopies).

A densiometer is used to measure the amount of light that penetrates the forest canopy. A simple densiometer is a device with a mirror apparatus inside that reflects the canopy above. It works somewhat like a periscope. The viewer sees a mirror image above, which allows him/her to estimate how much of the sky above is blocked by tree canopies.

In this protocol you will be using either a standard densiometer (method A) or a homemade densiometer (method B) if a standard one is not available. You will be using either method to estimate the percent of canopy cover at various sites. Previous to doing this activity, students should have selected and marked their team's study sub-plots.

Materials:
Method A- densiometer, pencil, data sheet, and site map

Method B- homemade densiometer, clipboard, pencil, canopy cover grid sheet, and site map.

A cheap method is to use empty toilet paper or paper towel cardboard tubes. Look up at the sky through the tube and estimate what percentage of the view is obstructed by tree branches and leaves. This is your estimate of canopy cover.

Figure 3-5. A simple densiometer to measure canopy cover.

Procedure:
- A) Read the appropriate protocol (method A or B).
- B) With your group select 3 plots within your sub-plot where data will be collected (see sampling activity).
- C) As per your instructors' directions choose role for protocol
  - Lead researcher- will be using the densiometer
  - Data collector- will record data

Method A

1) Make sure your class has set out the transect, and your team has set out its sub-plot before proceeding. You and your partner will be measuring canopy cover at three plots within your sup- plot (see sampling activity).
2) Record your location on your site map and on the data sheet.
3) The lead researcher will hold the densiometer at your eye level and look into the tube with the mirror.
   - A. Make sure that you hold the tube at a horizontal level so that you can observe the sky directly above you.
   - B. Estimate what percentage of the view is obstructed by tree branches and leaves. This number is your direct estimate of canopy cover.
   - C. Estimate the percent of canopy that is visible through the densiometer.
5) Record the percent of canopy cover on the data sheet.
6) Repeat the procedure at the other two sites you selected. Return to the classroom.
7) To get an accurate reading for your entire study area, many readings should be taken within the site. Using the class collection data sheet, average the results from the same site to obtain a better estimate.

Method B
1) Make sure your class has set out the transect, and your team has set out its sub-plot before proceeding. You and your partner will be measuring canopy cover at three plots within your sup- plot. (see sampling activity).
2) Record your location on your site map and on the data sheet.
3) The data collector will place the canopy cover grid sheet, with the clipboard underneath, flat on the ground directly below the canopy you will be estimating.
4) The lead researcher will then shade in the canopy cover grid where the canopy shadow falls.
5) Repeat this protocol at the other two sub-plots, using a new grid sheet at each location and return to the classroom for data analysis.
8) Using the canopy cover grid count the number of squares that are shaded in, you can add partial squares together. Calculate the percent of canopy cover using the format below the grid.
9) To get an accurate reading for your entire study area, many readings should be taken within the site. Using the class collection data sheet, average the results from the same site to obtain a better estimate.

Data Sheet
Method A

Sample 1

Location_____

Percent of Canopy cover_____%

_____

Sample 2

Location_____

Percent of Canopy cover_____%

_____

Sample 3

Location_____

Percent of Canopy cover_____%

_____

Canopy Cover Grid
Method B

Sample Site_____

\# of squares covered   /   # of squares not covered   X 100 = % canopy coverage

_____   /   _____   X 100 = _____% canopy coverage

Percent Canopy Cover _____%

Class Collection Data Sheet

Site and subplot	Percent Canopy Cover (%)
	Site Average_____%

Site Classification _____

Open Canopy = 10-39% of the sky is obstructed by tree canopies
Moderately Closed = 40-69% of the sky is obstructed by tree canopies
Closed Canopy = 70-100% of the sky is obstructed by tree canopies