



Lesson 10.1 Trees and People

Curriculum for Sustainability

Topic II

This Land is Our Land

Module 10: Forests

Concepts:

A tree is a plant that has a single woody trunk.

Trees perform a variety of functions within the urban environment

- 1) Take in carbon dioxide and give off oxygen as a by-product**
- 2) Absorb some airborne pollutants, reducing air pollution**
- 3) Stabilizing soil and preventing erosion**
- 4) Reduce water pollution in streams by absorbing storm water runoff through the roots and slowing runoff**
- 5) Provide shade**
- 6) Through shade and transpiration, cool the city and mitigate the urban heat island effect**
- 7) Provide homes for animals**
- 8) Provide food, building materials, medicines, paper, and other compounds for people**

Background information

- 1) Through the process of photosynthesis, trees are able to make their own food from sunlight, carbon dioxide, and water. Photosynthesis takes place in the leaves of the tree. Trees absorb CO₂ and other gaseous compounds in the air through small openings called stomata located mainly on the bottom side of the leaf. The chemical equation for photosynthesis is $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$. What this equation means is that 6 molecules of carbon dioxide, 6 molecules of water, and light energy are used by the plant to create a single molecule of sugar (food) and 6 oxygen molecules are the by-product.
- 2) When the stomata are open and air is taken into the leaf, gaseous pollutants are absorbed. Once inside the leaf, these compounds diffuse into the intercellular space. Other airborne compounds “stick” to the outer surface of the tree leaves. Since these compounds do not get absorbed into the leaves, the tree is only a temporary holding place for these compounds. These compounds can be returned to the air by wind, washed off when it rains, or dropped to the ground when the leaves fall.
- 3) Tree roots physically stabilize soil by growing into the ground, but there are other ways that trees prevent erosion. When water runs over the surface of the ground, it picks up



pieces of soil and organic matter as it moves. When water infiltrates the ground, soil and organic matter is deposited and erosion prevented. Trees aid in water infiltration in many ways. When rain drops hit the tree canopy, they are slowed down. By slowing the rain before it reaches the ground, trees give water more time to infiltrate the soil and help reduce the buildup of sheets of storm water runoff. Tree roots essentially create little tunnels in the soil, allowing for greater infiltration of water into the ground.

- 4) The roots of trees absorb water. Especially during a rainstorm, this is important in an urban environment because it reduces the buildup of storm water runoff, a major source of non-pointsource pollution in water bodies. When absorbing water, trees also take up nutrients and other compounds that are present in the water. This helps prevent those compounds from being washed into water bodies.
- 5) According to the United States Environmental Protection Agency (USEPA), surfaces in the shade can be 20 - 45°F cooler at peak temperature than the same surface without shade.
- 6) Through the process of transpiration, plants take up water through their roots and release it back into the atmosphere through the stomata in the leaves. The increased rate of evaporation of water helps cool the air. Shading and transpiration together lead to an overall decrease in air temperature during the summer, mitigating the urban heat island effect and reducing the amount of energy and resources need to cool buildings through air conditioning.
- 7) Trees offer shelter and food to a variety of animals including birds, lizards, small mammals, and insects. Increased biodiversity helps keep ecosystems intact, and the presence of carnivores such as hawks, insectivores, and carnivorous insects help reduce pest populations and control disease vectors.
- 8) People use a lot of products that come from trees. Some examples include
 - a. Oranges, apples, bananas, berries, maple syrup etc. as food
 - b. Rubber and fibers for ropes
 - c. Medicines
 - d. Dyes
 - e. Wood for building and heating
 - f. Paper

Links for more background information:

South Carolina Forestry Commission, "Benefits of Urban Trees."

<http://www.state.sc.us/forest/urbben.htm>

United States Environmental Protection Agency. "Trees and Vegetation" Information on how trees help mitigate urban heat island effects.

<http://www.epa.gov/heatisd/mitigation/trees.htm>



J. Stein Carter. "Photosynthesis" Selected Science Links – for detailed information on the process of photosynthesis.

<http://biology.clc.uc.edu/courses/bio104/photosyn.htm>

United States Geological Survey. "The Water Cycle - Water Science for Schools: Evapotranspiration." Information on the process of evapotranspiration

<http://ga.water.usgs.gov/edu/watercycleevapotranspiration.html>

Lesson:

Briefly discuss the benefits of trees in the urban environment. Provide students with the list of trees of Greenville and either allow them to choose or assign each student or small groups of students a type of tree to research. Allow students to research trees for 10-15 minutes and then report on their tree to the class.

Some guided questions for research:

- 1) What does the tree look like?
- 2) In what habitats is that tree commonly found (requirements for growth)?
- 3) Is the tree used in landscaping?
- 4) Do people use parts of this tree for anything, and if so, what?

Websites for research:

<http://www.duke.edu/~cwcook/trees/#trees>

<http://www.clemson.edu/extfor/publications/bul117/list.htm>

<http://www.fs.fed.us/database/feis/plants/tree/>

Expansion: This lesson could be paired with lesson 26.3 Tree Identification and background information from the Urban Naturalist Program

Optional Activity:

Tree Craft:

- 1) Have students gather leaves (or bring in some leaves from different common trees).
 - 2) Use crayons and white paper to create rubbings of tree leaves. (if you do this craft outside, students can also create rubbings of bark and other items that they find)
 - 3) Cut out the leaf impressions and glue them onto a sheet of cardboard, foam board, or heavy construction paper to form a collage.
 - 4) Gather twigs and use clippers (and adult should use the clippers) to trim them so that they are just a little bit larger than the collage.
 - 5) Use twine or yarn to bind the corners of the sticks or bundles of sticks together.
 - 6) Punch a hole in the top center and bottom of the collage and tie the pictures to the stick frame.
- Expansion: have students use a leaf key to identify their leaves.

Example of finished tree craft: All of the leaves were from a Water Oak (*Quercus nigra*)



Discussion Options or Writing Prompts for Older Students:

- Using the research that you did for the report, write a paragraph explaining how your tree is important to the environment and to people.
- Describe your favorite tree. Why is it your favorite tree?
- Imagine a city where there are no trees. Write a brief description of what that city might be like. How do you think Greenville would change if there were no trees in the city?