** Value of an Urban Tree**

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| **Overview**  Most people are well aware that trees support animal life by providing food and shelter, and most people are well aware that trees benefit the environment by emitting oxygen into the atmosphere. However, many people are surprised to discover that trees provide other benefits which have special significance to urban areas. Not only do trees provide beauty and monetary value to neighborhoods, they also help prevent water loss, decrease energy use, improve air quality and assist in keeping climate from becoming extreme. This lesson explores the benefits and economic value trees provide to an urban environment.  **Background**  Trees provide the following benefits to an urban setting:   * reduce storm water runoff * decrease energy consumption * improve air quality * moderate climate and temperature * reduce erosion and sedimentation * create habitats for animals * aesthetics * increase property value   **Storm Water Runoff**  *Issues:*  *Non-Point Source Pollution* - During a rain storm water runs off the surface and carries with it chemicals from natural and man-made sources. In city and suburban areas these chemicals include oil and gasoline from cars and highways. Additionally, cities often have large amounts of trash and litter on roads, next to expressways, and in parking lots. These chemicals and trash are washed from the surface and carried to wetlands, canals, rivers, and oceans. These chemicals also seep into the ground polluting aquifers.  In Miami, Florida, the Everglades coastal wetlands and local aquifer are of particular concern. As pollutants enter the Everglades, the sensitive and delicate ecosystem is damaged. As pollutants enter the Miami aquifer, drinking water is contaminated raising health concerns.  *Change in Water Flow* - Urban and suburban areas have large areas of asphalt and concrete. These surfaces do not allow rain water to soak into the ground, resulting in street flooding and a change in the natural flow of water.  *Tree Benefit:*  Trees help reduce storm water runoff. Leaves catch and hold onto rain drops, and branches and bark help hold water. Trees also absorb and keep water through their root system. By catching and keeping water, trees help to slow the rainfall and act as a water reservoir.  **Energy Consumption**  *Issue:*  Energy efficiency is a goal for all environmentally aware citizens. In Miami, hot humid summers and temperate winters result in enormous energy consumption through the use of air conditioning. The occasional arctic blast in winter requires the heating of homes and businesses which may also use large amounts of energy.  *Tree Benefit:*  Trees provide shade, and if planted in the proper place around a home or building can reduce energy usage and cooling costs. Trees also provide a wind break to reduce wind chill that may occur during cold weather.  **Air Quality**  *Issue:*  Pollutants in the air can cause or aggravate serious health problems including colds, respiratory congestion, asthma, headaches, heart disease, and even cancer. Urban areas can even have ozone levels higher than what is allowable by federal standards.  *Tree Benefit:*  Trees act as a purifier by absorbing gaseous pollutants into their leaves. These gaseous pollutants include ozone, nitrogen dioxide and sulfur dioxide. Trees are able to use their leaves, stems, and twigs to clean the air by trapping dust and smoke particulates. Through the process of photosynthesis, trees reduce carbon dioxide and produce oxygen. Some air pollutants increase when temperature increases. However, trees lower air temperature thereby lowering the amount of these pollutants.  **Climate and Temperature**  *Issue:*  In areas where local air temperature is increasing, there is an increase in the formation of additional ozone. Some cities such as Los Angeles and Mexico City are infamous for their thick and harmful smog. The smog thickens as temperature rises.  *Tree Benefit:*  The temperature in the area around trees is cooler than in areas that do not have trees. As trees help reduce temperature they help to decrease ozone production and the formation of smog. Trees in a parking lot can also help lower the emission of vehicle pollutants.  **Erosion and Sedimentation**  *Issue:*  Erosion in cities can undermine roads and buildings possibly resulting in their full or partial collapse. Heavy rains carry sediments into gutters, sewers, streams, and canals, clogging up the water paths and causing floods. In Miami, the sediments can empty into the Intercoastal Waterway and ocean requiring occasional dredging to allow water to flow naturally and to allow ships to sail without hitting bottom.  *Tree Benefit:*  The leaves of trees catch rain, slowing down how quickly it reaches the ground and allowing some of it to evaporate. This results in less raindrop impact with the ground and therefore less erosion and formation of sediment. Tree roots keep soil in place reducing erosion. Fallen leaves form a layer on the ground which permits water to trickle slowly to the soil underneath which also reduces erosion and the formation of sediments.  **Habitats for Animals**  *Issue:*  Trees are centers of interaction between living organisms. As trees are removed from urban areas, bird diversity decreases, resulting in a population shift in animal insect populations. The local ecosystem is affected.  *Tree Benefit:*  Trees help provide for a normal, active ecosystem to flourish in an urban area. Different species of trees allow native bird populations to thrive, which in turn promotes the healthy connections between a variety of animals.  **Aesthetics**  *Issue:*  As trees are removed from urban areas, the harsh visual lines of concrete and steel structures become dominate. These unnatural lines and sometimes ugly buildings affect people’s moods resulting in unhappy communities.  *Tree Benefit:*  Trees help provide a softening affect to the straight lines of cities, creating peaceful ambience. Trees can also offer privacy and screen unpleasant views. Trees can create  pleasant walking environments, and may add a sense of pride in one’s community.  **Economic Value**  *Issue:*  Areas with little or no trees tend to have low property value. Lack of trees increases the cost of air conditioning and heating, requires increased costs in limiting soil erosion, and may require constructing flood control structures.  *Tree Benefit:*  Trees provide economic value by helping to reduce energy costs, reducing erosion, helps control flooding, and ultimately increases property value.  **Objectives**  By using the *National Tree Benefit Calculator* (http://www.treebenefits.com/calculator/) students will determine the economic value trees offer to a city environment.  **Materials**  Measuring tape  Camera (optional)  Calculator  **Procedures**  Field Activity:   1. Locate a tree that is at least 6 feet tall and that is easily and **safely** reachable. 2. Record the name of the tree, if known. If you are not sure, record the type of tree (palm, oak, etc.). See your instructor for help, if needed. 3. Using the measuring tape, carefully measure the diameter of the tree at about chest level (4.5 feet above the ground). Exact height above the ground is not necessary. Record your results. 4. Look at the area surrounding the tree. Look at the choices in the data table, then indicate the most appropriate type of land-use. 5. Sketch the tree or take a picture. 6. Repeat the above for at least one other tree, making sure the two trees are of different types.   Class Activity:   1. Using the *Tree Benefit Calculator*  at <http://www.treebenefits.com/calculator/> determine the yearly economic value of each tree. Record the information. | **Grade Level**  9-12  **Goal**  Students will explore the value trees provide to the environment of a suburban area outside Miami, Florida.  **Motivate**  **Show the podcast located at** [**http://beta.lpb.org/index.php?/site/programs/return\_to\_the\_forest\_where\_we\_live/return\_to\_the\_forest\_where\_we\_live**](http://beta.lpb.org/index.php?/site/programs/return_to_the_forest_where_we_live/return_to_the_forest_where_we_live)  ***Key Concepts and Skills***  **Maps**   * *Students learn how to use and interpret maps* * *Students develop the concepts of location, space, place, scale, pattern, regionalization, and globalization.*   **Population**   * *Population issues involve many disciplines including science.*   **Data Analysis**   * *Web sites provide opportunities for students to determine population trends and issues.*   **Environment**   * *Recognize the impact urbanization has on the environment.* * *Students develop a sense of responsibility for protecting the planet.*   **Online Links to Tree Sites of Interest**  <http://www.arborday.org/trees/benefits.cfm>  <http://www.treelink.org/linx/?navSubCatRef=56>  <http://www.treesaregood.com/treecare/tree_benefits.aspx>  [http://warnell.forestry.uga.edu/service/library/index.php3?docID=124&docHistory[]=2](http://warnell.forestry.uga.edu/service/library/index.php3?docID=124&docHistory%5b%5d=2) |
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**Data**

**First Tree**

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| Name (or type) of tree: |
| Diameter, in inches, of tree: |
| What land-use type is this tree nearest?   * Single family residential * Multi-family residential * Small commercial business * Industrial or large commercial business * Park or other vacant land |
| *Sketch of the tree (or photo)* |
| *Current* dollar value of annual benefits provided by the tree (value at the top of the window): |
| Dollar value of annual benefits provided by the tree if it grows to *maximum* size (value at the bottom of the window): |

**Second Tree**

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| --- |
| Name (or type) of tree: |
| Diameter, in inches, of tree: |
| What land-use type is this tree nearest?   * Single family residential * Multi-family residential * Small commercial business * Industrial or large commercial business * Park or other vacant land |
| *Sketch of the tree (or photo)* |
| *Current* dollar value of annual benefits provided by the tree (value at the top of the window): |
| Dollar value of annual benefits provided by the tree if it grows to *maximum* size (value at the bottom of the window): |

**Analysis**

1. Tree #1.
   1. W as tree #1 at maximum size? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. How could you tell?

1. Tree #2.
   1. W as tree #2 at maximum size? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. How could you tell?

1. Imagine both trees were at their maximum size. Which tree would have the highest dollar value? If they both would have the same value, state so.

1. The dollar value of trees increases as the diameter of the tree increases. Propose some ideas why this happens.

1. The City of Miami proposed a *Tree Master Plan* to increase the city’s tree canopy coverage to a minimum of 30% by 2020. Describe the benefits the city would experience if this goal was reached.

1. Some trees and plants emit volatile organic compounds (VOCs) which react to produce smog. Some trees and plants that produce these VOCs are found in south Florida such as some oak species and the invasive plant kudzu.
   1. Take a side and debate if these trees that produce VOCs should be planted within urban areas. Be sure to support your answer with appropriate information.

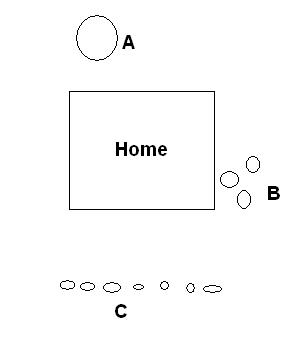
* 1. Should these trees be planted outside urban areas? Again, be sure to support your answer with appropriate information.

1. Congratulations! You have just been chosen to be in charge of creating a new *Tree Master Plan* for Miami*.* List and describe the three most important features of your new plan. Be sure to in include why they are important.

1. The President has heard of your *Tree Master Plan* and wants you to develop a plan that would benefit all cities. Which of your three features in #7 above would you keep and why?

**Extended Activity**

1. Examine the building in which you live. Sketch a map of your home and any trees that your home may have. If your home does not have any trees, select a building that does and sketch it. Using a legend, name and describe the trees, indicating the compass direction of where the trees are in relation to the building. Using the tree benefit calculator, estimate the annual dollar value the trees provide. Below is an example:



1. Poinciana, in front of house,
2. Palms, east side of house, $12.00 total (3 X $4.00 each)
3. Arecas, south side of house on edge of property, $21.00 total (7 X $3.00 each)

1. Analyze the effectiveness of each set of trees around the building. Be sure to think of shade during the different seasons, and throughout the day (morning, afternoon, evening). Think of wind block the trees may offer, water flow control, erosion, etc.

1. Based on your responses to #2 above, make recommendations to improve the tree benefits around your home.