



Grade Level:
11th Grade

Subject:
Chemistry

Exhibit:
#13 Demand
Management
(*Water loss from a tree*)

**Approximate
Time Frame:**
2 hours (*more than one
class period*)

Materials:

- paper
- pencil
- broad leaf tree
- zip lock bags
- Vaseline

Lesson Plan - "Thirsty Sweating Trees"

Science TEKS:

1. A Demonstrate safe practices during field and laboratory investigations.
1. B Make wise choices in the use and conservation of resources and the disposal or recycling of materials.
2. A Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
2. B Collect data and make measurements with precision.
2. C Express and manipulate chemical quantities using scientific conventions and mathematical procedures such as dimensional analysis, scientific notation, and significant figures.
2. D Organize, analyze, evaluate, make inferences, and predict trends from data.
2. E Communicate valid conclusions.
3. A Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information.
3. B Make responsible choices in selecting everyday products and services using scientific information.
3. C Evaluate the impact of research on scientific thought, society, and the environment.
3. D Describe connections between chemistry and future careers.

Related TEKS: Physics, Chemistry and Biology

Vocabulary of Instruction:

anatomical difference	humid microclimate
salt cedar	ecosystem

Advanced Preparation: Organize students' into groups

Instructional Procedure (5 E)

Engage: The students will prioritize water use by importance at an individual level, agricultural level and industrial level. Incorporate alternatives to water use. Design and complete a variety of lab exercises to help understand sources of water, water scarcity, and water conservation.

Explore: Talk to your grounds keeper to make him or her aware of your intentions of the experiment. The trees will not be harmed during the experiment but if the grounds keeper is not aware what you are doing he may remove your experiment

before you have collected any data. Students with allergies to pollen must be aware of the exposure to this and take necessary precautions.

After identifying the different desert and non-desert trees you are going to use, record some anatomical differences between them. Look closely at the bark, leaf size, root depth and any other noticeable differences and record your results.

Start with one small branch and the leaves in one square meter of that branch. Try to determine the total number of square meters of leaves on the tree. Multiply that by the number of leaves in one square meter to get an estimate of the number of leaves. This is just an estimate as some very large trees can have half a million or more leaves.

Chose about ten to twenty leaves randomly throughout the tree and place a zip lock bag over the leaves. Larger leaves will require larger zip lock bags. Put the whole leaf in the bag and zip the bag closed around the stripe of the leaf. You can even apply some Vaseline around the small opening left behind from sipping the bag closed to ensure no water escapes.

After two or three days go back to remove your bags from the leaves. Be careful not to spill any of the water and try to get as much water stuck on the leaf to remain in the bag.

Return to the lab and measure the water collected from all of the leaves and get an average of water from one leaf. Use this to determine the water loss from the whole tree using the estimate number of leaves. Compare the results of water loss from each tree on a leaf by leaf basis and on the whole tree basis.

Explain: A large broad leaf tree in the desert supplies much shade and a microclimate of humid air on a dry day. Low water tolerant trees have smaller leaves and other different structure designs in their bark, roots and leaves to help conserve water. The objective of this lab is to attempt to estimate the amount of water lost through transpiration out of tree leaves on different types of trees. After researching the different types of desert tolerant and non-desert trees, try to find some of the two types on your campus to do your experiment on.

Elaborate/Extend:

Questions:

How might a broad leaf tree create a humid microclimate within its branches? Why is it important to plant desert tolerant trees when you live in the desert? The Rio Grande River is lined along its banks with salt cedar, cotton wood and other types of trees. These trees create an ecosystem all their own that many organisms depend on for food, shade and shelter. Are these trees helping conserve ground water?

What type of trees would you replace them with to conserve both water and the ecosystems?

What type of public relation activity could your class develop to increase public awareness of water loss through trees?

Evaluate: Closure of class will consist of student groups developing and presenting a statement about what they learned today and how it may change their ideas toward their water use and other water usage in the city.

