



**Grade Level:**  
10th Grade

**Subject:**  
Biology

**Exhibit:**  
#13 Demand  
Management  
(Biomass)

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

**Materials:**

- paper
- pencil
- soil
- shovel
- gloves
- scale

## Lesson Plan - "It's Time to Move"



**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 Organize, analyze, evaluate, make inferences, and predict trends from data.
2. D 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. C Evaluate the impact of research on scientific thought, society, and the environment.
3. D Describe connections between biology and future careers.
3. E Evaluate models according to their adequacy in representing biological objects or events.
9. D Analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment.
10. C Analyze and identify characteristics of plant systems and subsystems.
12. A Analyze the flow of energy through various cycles including the carbon, oxygen, nitrogen, and water cycles.
12. D Identify and illustrate that long-term survival of species is dependent on a resource base that may be limited.
12. E Investigate and explain the interactions in an ecosystem including food chains, food webs, and food pyramids.
13. A Evaluate the significance of structural and physiological adaptations of plants to their environments.

**Related TEKS:** Physics and Chemistry

**Vocabulary of Instruction:**

biomass  
water demand  
biotic

drought  
extrapolate

**Advanced Preparation:** Organize students' into groups

**Instructional Procedure (5 E)**

**Engage:** The students will prioritize water use by importance at the level of human demands and the demands of ecosystems. Incorporate alternatives to water use. Understand the role of plants in water use and their role in ecosystems. Design and complete a variety of lab exercises to help understand the effects of water scarcity on plants and other organisms and adaptations that organisms have developed to handle dry climates.

**Explore:** It is important that you chose an area that is okay to dig up soil without getting in trouble. Check with your grounds keeper on your school campus for areas that can be dug up. The dirt and organisms you remove from the area will eventually be returned but may leave a scar for a while until it grows back. Try to choose areas that are not heavily cultivated but may have different water availabilities. Students with hay fever or allergies to bug bites take special caution during this lab.

First determine the area you are going to use to determine the biomass in. It may be an area as large as a football field or a drainage area. Just make sure that the area is consistent in similar plant life throughout.

Now choose one or two areas randomly throughout the plot and dig up the soil down about a foot deep and all the plant life in a ½ square meter area.

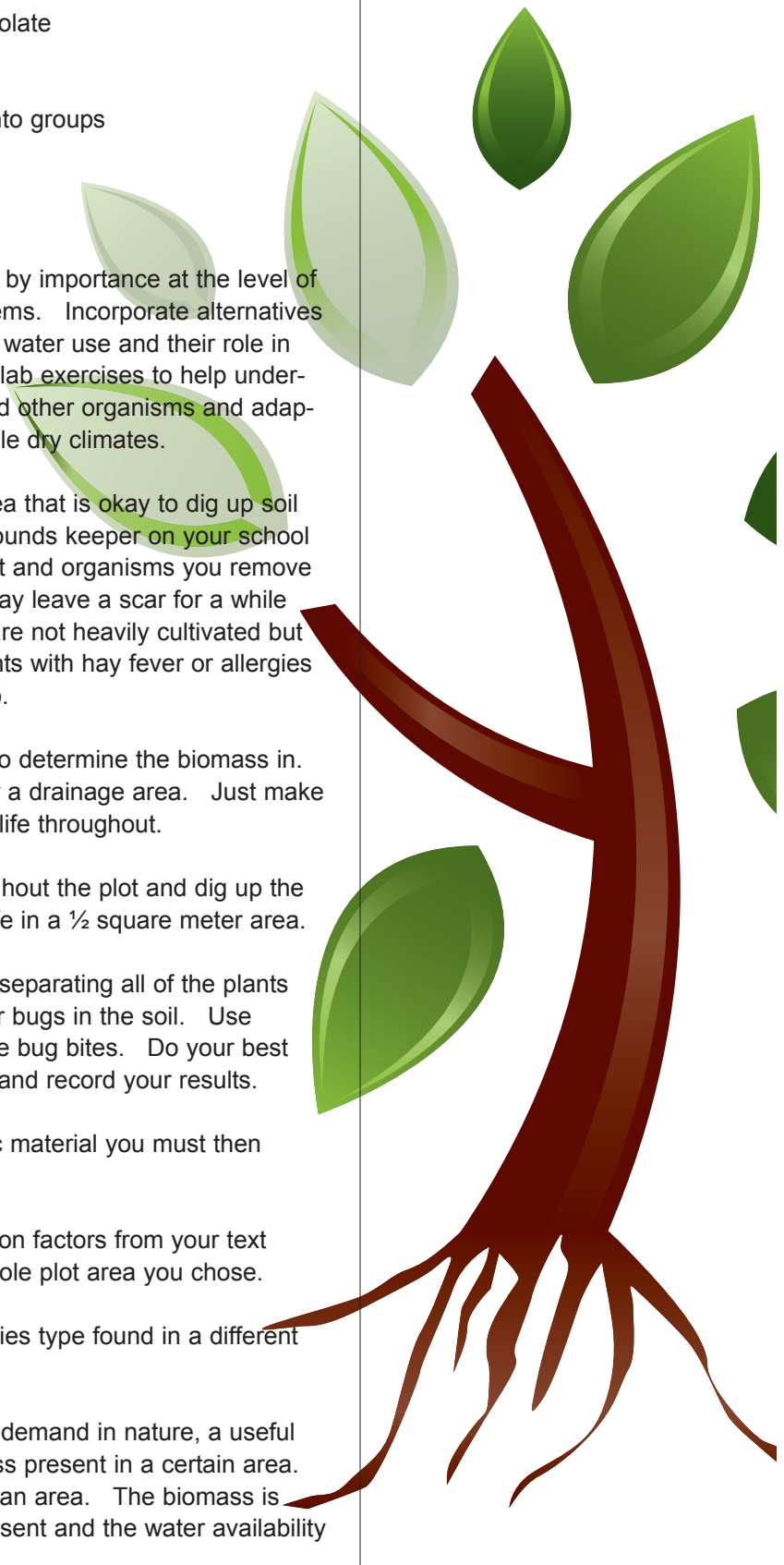
Take these samples back to the lab and begin separating all of the plants with their roots and all and any other worms or bugs in the soil. Use gloves to protect you from stickers and possible bug bites. Do your best to identify the plant life in the area you dug up and record your results.

When all of the soil is separated from the biotic material you must then weigh the plants and animals.

Use this weight and extrapolate using conversion factors from your text books to determine the total biomass in the whole plot area you chose.

Compare your results to the biomass and species type found in a different type of plot.

**Explain:** When it comes to determining water demand in nature, a useful measurement to make is the amount of biomass present in a certain area. Biomass includes all of the living organisms in an area. The biomass is directly related to the species of organisms present and the water availability



**H**ow  
might  
seasonal water  
availability affect  
**biomass**  
**and**  
**species**  
diversity in an  
area?

so if there is very little water available there should be very little biomass and drought resistant plants and animals. The opposite is true if there is much water available there should be more biomass and different species of plants and animals. In some cases of drought, the water demand of the current species and biomass may exceed the availability of water and organisms will begin to die from lack of water. The objective of this lab is to determine the amount of biomass in an area such as a large park or a large section of desert. Relate that biomass and the species present to another area with significantly more water availability.

**Elaborate/Extend:**

**Questions:**

Explain how biomass and species types might have an effect on water availability in an area.

How might seasonal water availability affect biomass and species diversity in an area?

How might a migrating animal use the visual clues of species diversity to determine the water availability of an area and weather or not to stay in the area or to move on?

How could a farmer use this to determine the amount of cows a certain area can support?

How much biomass do you think is in a large tree and how do you think this tree affects water availability in the soil?

Trees have adapted many methods of seed dispersal. Why do you think it is important for a tree to disperse its seeds away from the mother tree?

**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.