# How Fast Does This Tree Grow?

## Introduction

The process of knowing the trees in your neighborhood began the first time you walked outside and noticed the trees in bloom. Recognizing fall leaf color may have inspired you to make a collection. Not knowing what exactly to do with the leaves, they soon became dry and brittle; so much for the collection.

With age comes a greater appreciation of trees. Trees give us shade in the summer, a wind break in the winter, and a place for many types of small animals to live. We realize trees grow slowly, but live a long time. Many a poet has written about trees, and you can find innumerable passages in literature about them. Now with the ever changing urban habitat we need to learn even more about trees to find the ones that will serve us best.

With the tools of a Forester, and even some you can find in hardware stores, you can determine if a tree is growing well. Other tools are used by Foresters in a heavily wooded site compared to the urban forest we are examining. We start with simple measurements of **height, diameter at breast height, and twig growth**.

There are several different ways to evaluate the health of trees. The methods we are going to use here are just a few of the ways that growth data can be gathered.

## Questions

1. How does the data collected about trees tell us more than just height, width or growth pattern?

## Hypothesis

*Students should make their own before continuing.*

## Materials

Metric ruler
Clinometer
Stool
100 ft tape
Tree identification key
Diameter tape
Journals (logbook)
Data tables

## Procedure

1. The student group should practice using all the tools before going outside.
2. Each member of the group should calculate how many steps it takes to pace 100 ft. Each student should practice pacing several times to get an average. Make a small data table with this information.
3. Make sure you know how to use the clinometer before going outside. This data goes in Table B.
4. Each group should prepare a checklist of materials and a data table. A simple pocket calculator can be used to calculate the averages.
5. Each student should be able to identify terminal bud scars, since these are the points that must be used to measure twig growth. This data goes in Table A. Add data from other groups.
6. Either a compass or a map with directions on it should be used to determine the directions for gathering data as accurately as possible. This data goes in Table A.

**Table A:**

## TREE TWIG LENGTH

| | | | TWIG GROWTH | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tree No. | Tree Species | Direction N/S/E/W | 19__ | 19__ | 19__ | 19__ | 19__ | AVG |
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| | | | | | | | | |
| | | | | | | | | |

**Table B:**

## TREE DATA

| Tree No. | Tree Species | Tree Height | Tree Diameter |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| | | | |

## Discussion Questions

1. Which tree species had the greatest twig growth last year? Which tree species had the greatest average twig growth over the last five years? Why?
2. Is there a pattern to the data? What is the pattern that your group sees? Give three reasons for it.
3. Were any of your trees planted in the last five years? Which ones? Why?
4. What are two other methods or instruments that could be used for this exercise? Give the reasons you believe so?

## Conclusions

1. If you were to do this exercise again, what technique would you change and why?
2. What other data would you need to make an accurate estimate of the health condition of the trees you used for this exercise?

## Blowouts

1. Do the trees in urban areas following typical growth patterns?
2. What problems do the Urban Forest have to contend with, in order to survive?

## Background Information

Trees are living organisms just like our students. Tree growth is just easier to quantify, since they don't move at a fast pace. The data gathered in this exercise must be gathered over long periods of time (3 or more years), in order to draw conclusions. Long-term data gathering is not unusual. NutraSweet7 took 10 years of research before it was released into the market. The FDA requires much time and many studies before allowing a new drug on the market. Trees have now become a renewed area of study, searching for chemicals that may be useful to humankind, such as taxol. This chemical comes from the bark of the Pacific Yew tree, which for years was considered waste by the forest industry. Time is a key ingredient in science and this is a study which will help students to appreciate patience and persistence. Lumber companies and many state forestry departments publish information about tree programs that can be valuable in demonstrating the long-term commitment to trees.

Science does not happen in one hour of class time, nor does a tree grow to thirty feet tall in one year. The old adage was 'speed kills'. This is very true in plants. The faster the tree grows, the shorter its life expectancy. In urban areas we plant fast growing trees to get shade quickly, but then in 10 years the tree is too large for the spot and it is taken down. Tree growth can point this out dramatically and provide useful information for future plantings.

## Target Group

High school. Designed for 50 minute sections, but can be used at lower levels, if the amount of data gathering is adjusted.

## Timeline

| | |
|---|---|
| Day 1 -- | Discuss the tools to be used and their proper use. This will be a class data collection project and if proper use of the tools is not stressed, the data will not be valid. It would probably be useful to have some of the tree cross sections out for practice. An object that is 100 feet from the class windows could be measured for height and then used as practice. Prepare data tables, vocabulary and complete work in student 'Logbooks'. |
| Day 2 -- | Students will take prepared data tables to the assigned sites for making measurements. Students will work in groups and every one should take data to check on the other's work. |
| Day 3 -- | Students will work on the data in the classroom, gathering data from two other groups. Conclusions can then be drawn for completion of the experiment. |

## Placement of Lab in Curriculum

This is part of the Forestry Unit and will fit in with any unit on tree or plant growth. This is also a good measurement lab, where students will develop data tables for organizing information that others will check.

## Student Learning Objectives

Students will be able to:

1. Evaluate data collected on trees.
2. Replicate the results of another student's experiment.
3. Demonstrate that data reflects the accuracy of the measuring devices used.
4. Apply quantitative observational methods to accumulate precise data about trees.
5. Evaluate the interpretation of data collected during each experiment.

## Preparation and Teaching Tips

Once the trees have been tagged, assign trees (by number or site) to students for collecting data. Stress that this will be part of the school's permanent record on tree growth. If students are using maps with numbers, make sure that they all know where they are going and which tools should be with them. If each student prepared his/her own checklist for the equipment needed for this assignment, it would foster responsibility on the student's part.

## Blowouts

1. Students can enter the data into a computer spread sheet for the entire class. Then each group display the data graphically in different ways to making comparisons of how well the trees are growing.
2. Students can look up the expected growth rate of the species they are examining and develop a hypothesis to explain differences in the data they accumulated.
3. Students can determine the year the tree was transplanted, or if it was always on the site.

## References


1. *Project Wild*. Western Regional Environmental Education Council. 1986.
2. *Project Learning Tree*. EEAI.
3. *Field Biology for Secondary Students*. Burton Voss. University of Michigan Biology Station. 1988.


**example table:**

**Table A:**

### TREE TWIG LENGTH

| | | | TWIG GROWTH | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tree No. | Tree Species | Direction N/S/E/W | 1993 | 1992 | 1991 | 1990 | 1989 | AVG |
| 1 | Red Maple | N | 10 cm | 7.5 cm | 12.5 cm | 10 cm | 10 cm | 10 cm |
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