The Carbon in Trees

Biofuels & Carbon Sequestration Powerpoint by Maria Janowiak from Future Fuels Institute at Michigan Technologial University 2009

Description: Most scientists are concerned about the recent rise in CO_2 in the atmosphere, which is probably causing global warming. This problem has motivated many researchers to study how trees **sequester** (store) carbon and remove it from the air.

Objectives: Estimate the amount of carbon stored in a single tree.
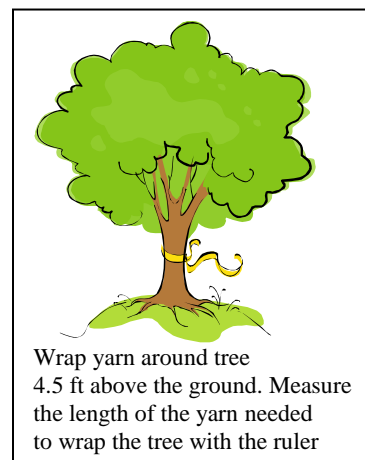
Materials Needed:
Tree; Yarn; Ruler; Calculator; Pencil; Equation for tree species

Instructions:

Step 1: Determine Diameter

Measure the **circumference** of the tree at chest height (about 4.5 feet off the ground; see figure) in cm. Then, using the tree circumference, calculate the **diameter** ($d = C / \pi$).

Wrap yarn around tree 4.5 ft above the ground. Measure the length of the yarn needed to wrap the tree with the ruler

Circumference: _____ cm   Diameter: _____ cm

Step 2: Calculate biomass for whole tree.

To calculate tree biomass, we use a standard equation of the form $\underline{\mathbf{M=aD^b}}$ where

- M is aboveground tree biomass (dry weight; kg),
- D is the diameter at breast height (cm), and
- "a" and "b" are species specific numbers. Locate the coefficients for the species of tree that you have in the table and calculate tree biomass (M).

Tree Species: _____

Biomass (M): _____ kg

Species	a	b
White Ash	0.16	2.35
Aspen	0.05	2.51
Balsam fir	0.07	2.50
American Basswood	0.09	2.35
American Beech	0.20	2.39
Eastern hemlock	0.10	2.36
Northern white-cedar	0.09	2.23
Red maple	0.16	2.31
Red oak	0.13	2.42
Red pine	0.78	2.42
Sugar maple	0.17	2.36
River birch	0.12	2.43
White oak	0.20	2.16
White pine	0.75	2.38
Yellow birch	0.09	2.59

Step 3: Determine carbon content

Since carbon is the major building block for life, a tree contains a large portion of carbon (about half of its biomass). To determine how much carbon is in your tree:

Multiply biomass (M) by 0.51.

Carbon content: _____ kg Carbon

Multiply by 2.2 to convert to lbs. Carbon content: _____ lb Carbon

Comprehension Questions

1. What process does the tree perform in order to obtain its carbon?

2. Describe one way that the carbon stored in this tree could be released back into the air.

3. If the average car emits about 2000 lbs of carbon each year, how many of your trees is needed to store all that carbon?