Activity: The Carbon in Trees

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

Description: Recent interest in the use of forests for carbon sequestration and bioenergy require knowledge about the amount of carbon stored in a tree or forest. For this activity, you will estimate the amount of carbon stored in a nearby or favorite tree.

Objectives: Measure tree diameter; calculate biomass and carbon mass

Materials Needed:
Tree(s); Diameter tape and/or tape measure; Calculator and/or spreadsheet software; Pencil; Allometric equation for tree species

Wrap tape measure around tree 4.5 ft above the ground. On a leaning tree, make sure the tape is perpendicular to the trunk.

Instructions:

Step 1: Measure Diameter

If using a tape measure, measure the circumference of the tree at breast height (1.37 m (4.5 feet) off the ground). If necessary, convert this value to cm. Then, divide the circumference by 3.14 to calculate diameter.

Circumference: _____ cm Diameter: _____ cm

OR: If using a diameter tape, the tree is measured the same way but it is not necessary to calculate diameter since the tape already does that for you. If necessary, convert this value to cm.

Diameter: _____ cm

Step 2: Calculate biomass for whole tree.

To calculate tree biomass, we use a standard allometric equation of the form $\mathbf{M=aD^b}$ where M is aboveground tree biomass (dry weight; kg), D is the diameter at breast height (cm), and "a" and "b" are species specific coefficients. 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
Ash	0.16	2.35
Aspen	0.05	2.51
Balsam fir	0.07	2.50
Basswood	0.09	2.35
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
White 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 0.521 for **hardwood** trees. Multiply biomass (M) by 0.498 for **softwood** trees. Carbon content: _____ kg C

Multiply by 2.2 to convert to lbs.

Carbon content: _____ lb C

Bonus Question: One lb of C is equal to 3.67 lbs of CO_2. Also, a car emits 19.6 lbs of CO_2 for each gallon of gas. If a person uses 400 gallons of gas a year, then their CO_2 emissions from driving would equal the amount of carbon sequestered in _____ of these trees.