Bringing Wetlands to Market Part 1 Exercise 1
Where is Carbon Found? A Carbon Walk
Adapted from What contains carbon?

Overview
In this exercise, students will review the carbon cycle and survey a local environment to find materials that contain carbon.

Time Required
One 45-minute class session

Focus Questions
Where is carbon found?
What are the major components of the carbon cycle?
Where do the largest volumes of carbon move each year?

Performance Tasks
Students will list where carbon can be found in the classroom or in an environment around the school.
Students will be able to describe the major components of the carbon cycle and the major carbon fluxes, or movements, each year.
Students will be able to describe how wetlands function as part of the carbon cycle.

Scientists in the BWTM project are trying to find out where carbon is stored in the marsh ecosystem and how it is taken up and emitted.

Background for teaching
Carbon is an extremely common and important element on the earth. It comprises approximately 50% of all living tissues and is present throughout Earth systems. In this activity students will realize that carbon can be found in many forms all around us: In the air, in food, in clothes, and in all animals and plants.

The objects in the materials list represent some of the many types of substances that contain carbon. Many marine organisms extract calcium and carbon compounds from the water around them to form calcium carbonate shells. Wood contains carbon because trees take in carbon dioxide from the air in photosynthesis. Plastic is derived from petroleum, which contains hydrocarbons, compounds composed of hydrogen and carbon. Various kinds of fabric contain carbon from different sources. For plant-based fabric such as cotton, the carbon comes from the photosynthetic process. Synthetics such as polyester are made from petroleum products. Carbonated beverages are named for the carbon dioxide gas that has been dissolved in the liquid, creating their fizz. Water also contains dissolved carbon dioxide, although in much lower concentrations than carbonated beverages.

Although some things, such as aluminum cans and glass windows, do not contain carbon, it is ubiquitous in our daily lives. Carbon is present in organisms, rocks, soil, atmospheric gases, and water. In the carbon cycle, carbon atoms and carbon compound molecules move from one place to another through a variety of processes over short or long time periods.

Materials

Collect an assortment of materials such as pencils, shells, pieces of wood, plastic, fabric, a carbonated beverage, a cup of water, and other carbon-containing objects and materials; and for contrast, some objects that do not contain carbon such as aluminum and glass; or use images of a variety of objects or a scene from a developed or natural area.
Student page: Global carbon cycle diagram

Procedure

1. Review the carbon cycle with students. You may choose to review the carbon cycle **before** or **after** the students take a carbon walk. A diagram of the carbon cycle is included at the end of this lesson.

   The following readings and activities may be used to introduce or review the main reservoirs of carbon and their volumes, as well as the volumes exchanged annually: "The Carbon Cycle" and "Quantifying the Carbon Cycle"
   Short carbon cycle background
   More in-depth carbon cycle background

   This basic introduction to the carbon cycle includes an engaging animation as well as a complete text of the script

2. Ask students, "What kinds of things contain carbon?" and list their responses on the board. You may wish to list the items in categories by the forms of carbon, such as carbon dioxide, hydrocarbons, carbohydrates, and so on.
   See background section for information and guidance.

3. Pass out or display all of the objects or images. Discuss as a class whether each object contains carbon or not. Have students explain their answers.

4. Make sure each student has paper and pencil or a portable device for recording observations. Take the class outdoors and walk around the school yard. Ask students to list as many objects as possible and note whether the object has carbon in it. Remind them to consider natural and human-made objects, as well as solids, liquids, and gases. Have them record the form of carbon (such as carbon dioxide, carbohydrate, or carbonate) for each source if they know it.

5. Return to class and have students take a few minutes to find information for the objects or sources they weren't sure about. Did they find carbon in any unexpected places?

6. Ask students to suggest the types of places that may hold a lot of carbon, and those that may not have very much. For example, do they think there is more carbon in a given volume of air or the same volume of wood from a tree?
   Plant materials, animals, topsoil, and plastics contain a good deal of carbon.

Assessment: Ask students to describe how wetlands are part of the carbon cycle. Remind them to consider the air and water exchanges that occur in a wetland as well as the plants, animals, and soil there.
Wetland plants take in carbon through photosynthesis and store it as biomass. Carbon is returned to the atmosphere through respiration and decomposition. Because decomposition takes place slowly in the low-oxygen environments that are typical of wetland soils, these soils can contain large amounts of carbon.

Optional activity: You may choose to use this activity before or after the carbon walk to generate discussion about how carbon dioxide in plants can return to the atmosphere, burn a wooden splint (if this can be done safely in class), or show this video of a campfire . Ask students to describe what is happening to the carbon in the wood, where the carbon came from, and where it is going. Here is a resource for additional information about what is happening when wood burns .

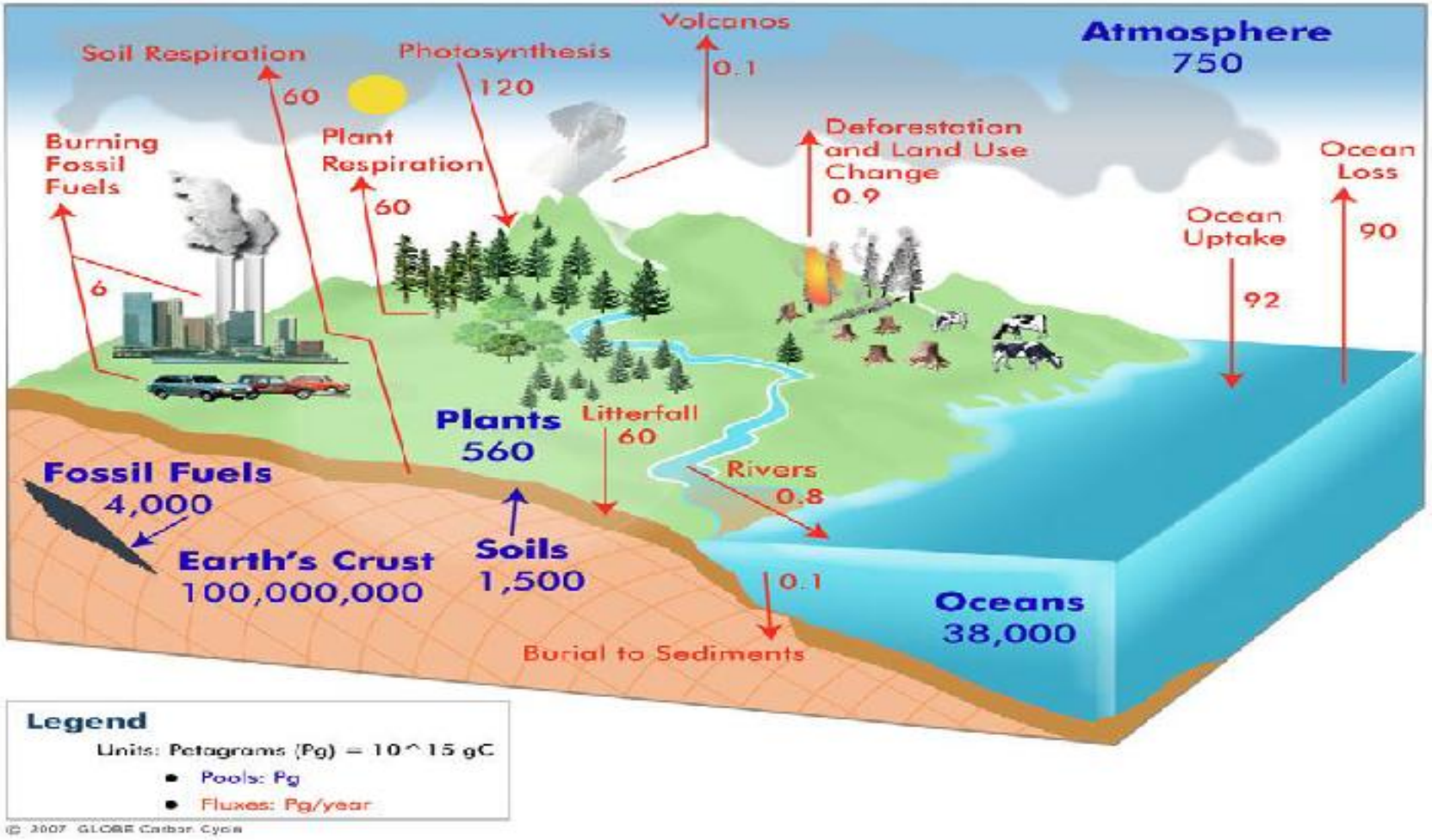
Climate connections

Because of the connection between atmospheric carbon dioxide and climate change, climate change is an important part of the Bringing Wetlands to Market research project. These two web sites contain a lot of information and many resources for teaching about climate change.

A good source for climate education materials is the Climate Literacy Awareness Network CLEAN

The NOAA Climate Portal has many resources, including clear graphics on present status of climate indicators and background information on climate science.

Global Carbon Cycle



1 petagram = 1quadrillion grams of carbon, or 1.1 billion tons of carbon