

The Forest Carbon Cycle Journey

(Adapted from Jennifer Ceven's adaptation of the "The Incredible Journey," Project Wet)

Summary:

By rolling a die, students will simulate a molecule of carbon's movement throughout various locations within the carbon cycle.

Objective:

- Students will describe the movement of carbon within the forest carbon cycle.
- Students will evaluate the relative timing of movement through various locations in the carbon cycle.

Materials:

- 7 Dice
- 7 Station Signs
- 7 Station Movement Directions
- Data record sheets for each student

Background:

The movement of carbon through various aspects of the natural environment is the focus of much scientific research. Global warming and climate change can be attributed to the increased amount of heat-trapping gases, such as carbon dioxide. Students must develop an understanding of how carbon moves through the environment in order to appreciate the complexity of developing solutions to address problems associated with climate change.

One area that applies these concepts is forest carbon sequestration, which looks at how to maximize carbon storage through forest management practices. This activity illustrates the movement of carbon through seven major areas of forests – Living Trees, Understory Vegetation, Standing Dead Trees, Down Dead Wood, Forest Floor, Soil, Animals, and the Atmosphere.

Warm-Up:

- Review the global carbon cycle. Background information can be found at <http://www.physicalgeography.net/fundamentals/9r.html>

The Activity:

1. Tell students that they are going to be carbon atoms moving through the carbon cycle.
2. Categorize the places carbon can be found into these stations: Living Trees, Understory Vegetation, Standing Dead Trees, Down Dead Wood, Forest Floor, Soil, Animals, and the Atmosphere. Point out the areas of the room that are labeled with each station and contain the directions for movement from that station.
3. Assign students to each station randomly and evenly. Have students identify the different places carbon could go from that given station. Discuss the processes that allow for the transfer of carbon between stations. Students should make a line and roll the die individually to follow the directions for movement from (or retention at) each

station. Remind them that they are representing atoms of carbon moving through the carbon cycle and that they should record their movements on the data sheet.

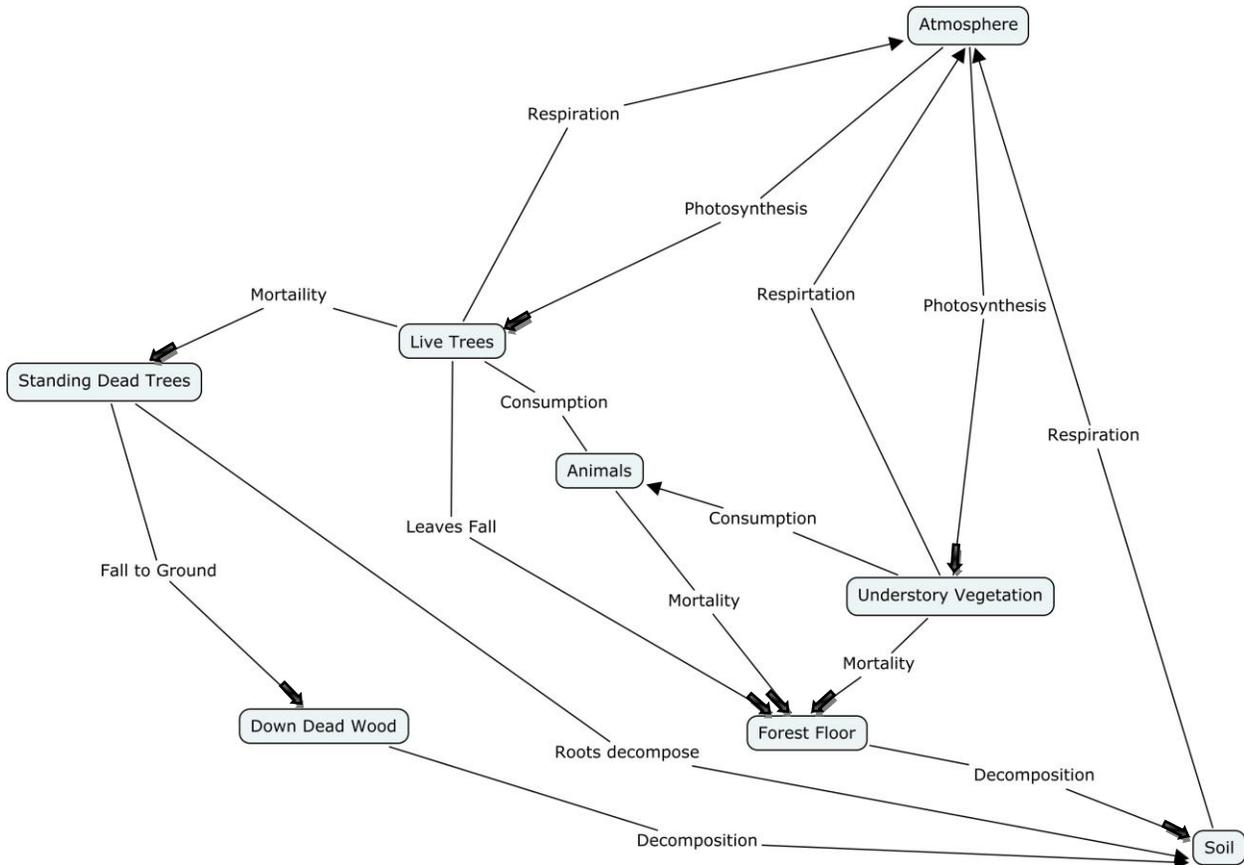
4. Students will realize the routine movements (or non-movements) in the carbon cycle.
5. Once the carbon atoms (students) have had a chance to roll the die ten times, have each student create a bar graph using the data they collected. The bar graph should represent the number of times the carbon atom (student) was at each station.
6. Using graph paper, create a large bar graph recording the number of carbon atoms (students) at each station.

Wrap-Up and Action Plan:

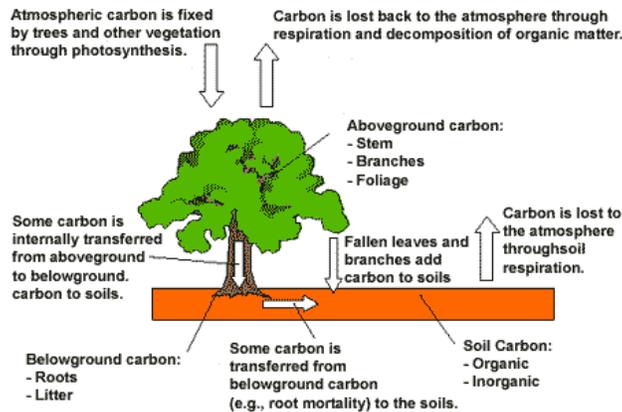
- Ask a few students to tell the story of how their carbon atom moved through the cycle.
- Discuss the results – using the bar graph have the students explain where the most/least amount of carbon was in the cycle?
- Write a story about your carbon atom as it moved through the carbon cycle.

Forest Carbon Cycle

REFERENCE PAGE



Another more simplified reference.



Forest Carbon Cycle

DATA RECORD SHEET

Record the places you have traveled as a carbon atom.

Student's Name: _____

	Station Stop	What Happens	Destination
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____

Forest Carbon Cycle

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3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____

Atmosphere

You are currently a molecule of carbon dioxide in the atmosphere



If you roll...	Then you ...
1	Stay in the atmosphere. Much of the carbon dioxide in the atmosphere circulates through the atmosphere.
2	Go to Tree. You are used by a tree in photosynthesis. <div data-bbox="737 1045 997 1180" style="text-align: center;"> </div>
3	Stay in the atmosphere. Much of the carbon dioxide in the atmosphere circulates through the atmosphere.
4	Stay in the atmosphere. Much of the carbon dioxide in the atmosphere circulates through the atmosphere.
5	Go to Tree. You are used by a tree in photosynthesis.
6	Go to Understory Plant. You are used by an understory plant in photosynthesis. <div data-bbox="789 1598 1045 1751" style="text-align: center;"> </div>

Living Trees

You are currently carbon in a living tree



If you roll...	Then you ...
1	Go to <u>Forest Floor</u> . The tree shed its leaves.
2	Stay in <u>Living Tree</u> . You are carbon in the tree's trunk.
3	Go to <u>Animal</u> . The leaves that the tree produced contain your carbon molecule and were eaten.
4	Go to <u>Standing Dead Tree</u> . The tree died but you remain as carbon in the standing dead trunk.
5	Go to <u>Down Dead Wood</u> . You are part of the tree branch that broke off and fell to the ground.
6	Go to <u>Atmosphere</u> . During the night with no sunlight you were respired back into the atmosphere.

Animals

You are currently carbon in an animal



If you roll...	Then you ...
1	Stay in <u>Animal</u> . You are stored as fat in the animal.
2	Go to <u>Soil</u> . The animal that consumed you died and your carbon is returned to the soil.
3	Go to <u>Atmosphere</u> . The animal that consumed you respired (breathed) you out as carbon dioxide.
4	Stay in <u>Animal</u> . You are eaten by a predator.
5	Go to <u>Atmosphere</u> . The animal that consumed you respired (breathed) you out as carbon dioxide.
6	Go to <u>Soil</u> . You left the animal as scat and returned to the soil.

Soil

You are currently carbon in the soil



If you roll...	Then you ...
1	Stay in the <u>Soil</u> . Much of the carbon in the soil is stored there.
2	Stay in the <u>Soil</u> . Much of the carbon in the soil is stored there.
3	Stay in the <u>Soil</u> . Much of the carbon in the soil is stored there.
4	Go to the <u>Atmosphere</u> . Some carbon is transferred to the atmosphere through soil respiration.
5	Stay in the <u>Soil</u> . Much of the carbon in the soil is stored there.
6	Go to the <u>Atmosphere</u> . Some carbon is transferred to the atmosphere through soil respiration.

Understory Vegetation

You are currently carbon in Understory Vegetation



If you roll...	Then you ...
1	Go to <u>Atmosphere</u> . You were respired (breathed) into the atmosphere at night when photosynthesis is unable to occur.
2	Go to <u>Forest Floor</u> . You are part of the plant that died and you became a part of the forest floor.
3	Go to <u>Soil</u> . You were part of the plant root that died and became a part of the soil
4	Go to <u>Animal</u> . You were a part of the leaves or woody stem of the plant and were eaten by an animal.
5	Go to <u>Forest Floor</u> . You are part of the plant that died and you became a part of the forest floor.
6	Stay in <u>Understory Vegetation</u> . You are part of a woody stem that persists from year to year.

Standing Dead Trees

You are currently carbon in a Standing Dead Tree



If you roll...	Then you ...
1	Stay in Standing Dead Tree. You are part of the main trunk that remains standing
2	Go to Down Dead Wood. You are carbon in part of the trunk that falls to the ground.
3	Go to Down Dead Wood. You are carbon in part of the trunk that falls to the ground.
4	Go to Soil. You are a part of the root system of the dead tree that decomposes underground.
5	Stay in Standing Dead Tree. You are part of the main trunk that remains standing
6	Go to atmosphere. You are part of the tree that decomposes while standing and are released to the atmosphere

Down Dead Wood

You are currently carbon in a Down Dead Wood



If you roll...	Then you ...
1	Stay in <u>Down Dead Wood</u> . You are part of large log that has not decomposed yet.
2	Stay in <u>Down Dead Wood</u> . You are part of large log that has not decomposed yet.
3	Go to <u>Soil</u> . You have decomposed.
4	Go to <u>Soil</u> . You have decomposed.
5	Go to <u>Soil</u> . You have decomposed.
6	Go to <u>Atmosphere</u> . You are part of the tree that decomposes while standing and are released to the atmosphere

Forest Floor

You are currently carbon in the Forest Floor



If you roll...	Then you ...
1	Go to <u>Soil</u> . You decompose and become a part of the soil.
2	Stay in <u>Forest Floor</u> . You have not decomposed yet.
3	Stay in <u>Forest Floor</u> . You have not decomposed yet.
4	Go to <u>Soil</u> . You decompose and become a part of the soil.
5	Stay in <u>Forest Floor</u> . You have not decomposed yet.
6	Go to <u>Soil</u> . You decompose and become a part of the soil.