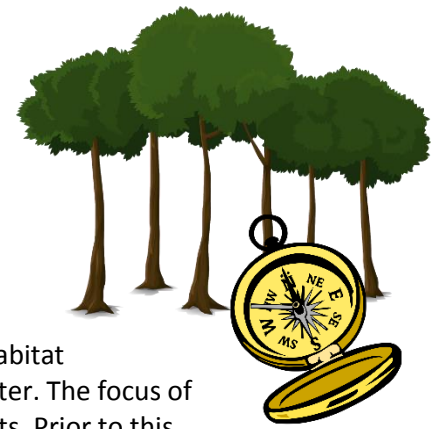


## Lesson: Forest Around Us

**Environmental Literacy Question:** How has human land use affected the living things in the Chesapeake Bay?

**Topic/Essential Question:** How do weathering and erosion change the earth?

**Unit/Lesson Sequence:** This lesson is one of three interdependent lessons in the “Habitat Happenings Module.” The lessons are based at Arlington Echo Outdoor Education Center. The focus of the lesson is on investigating the role of trees in both natural and human-made habitats. Prior to this lesson the students will have engaged in an introduction conducted by the Arlington Echo staff.



### Content Standards:

- **Environmental Literacy:**  
8.Sustainability F. Action Component 1. b. Identify actions that can be taken as individuals and those that require the involvement of other people, organizations and government.
- **Social Studies:**  
3.Geography D. Modifying and Adapting to the Environment.1.b Describe ways and reasons people in Maryland and the U.S. modify the natural environment and the consequences of modifications.
- **Science:**  
3.Life Science 4.D.1.a. Describe ways in which organisms in one habitat differ from those in another habitat and consider how these differences help them survive and reproduce.  
3.Life Science 4.F.1.a. Identify and describe interactions of organisms present in a habitat.  
3.Life Science 4.F.1.b. Explain that changes in an organism’s habitat are sometimes beneficial to it and sometimes harmful.

### Length of Lesson:

Day program: 45 minutes

Overnight program: 60 minutes

### Student Outcome:

The student will study and describe one to two living organisms located within a human-made habitat at Arlington Echo.

### Knowledge of the Learner:

Students have a basic knowledge of the difference between natural and human-made systems. Animals have four basic needs which are found in their habitat: food, shelter, water, and enough space to meet those requirements and to reproduce. Students will use their skills of observation, listening, and following instructions to learn about the role that trees play in natural environments and the resources that trees offer to organisms living in the forest.

- Student needs, interests, previous learning: These will vary among students.
- Conceptual difficulties: Being able to find and identify the organisms.
- Differentiation: Teachers will adjust the lesson based on the knowledge of their students’ skills.

### Knowledge of Content:

Students will learn why trees are important and learn about the various roles that they play in a forest environment. They will complete an action project that helps trees and helps prevent erosion. They will complete activities around campus that teach them about the organisms that rely on trees in their different forms for food and shelter. Content knowledge for instructors is provided in the lessons and supplements.

## Vocabulary:

Atlantic White Cedar  
Cache  
Canopy  
Chlorophyll  
Circumference

Compass  
Decomposition  
Forest  
Habitat  
Nutrients

Orientation  
Photosynthesis  
Waypoint

## Resources and Materials:

Root display  
Soil  
Plants  
Pots

Trowels  
Tree Breaths Chart  
Fish Tank Filter  
Cones

Terrarium

## Supplements:

**A:** Information on Forests  
**B:** Tree Breaths Per Day Chart  
**C:** Discussion Questions  
**D:** Vocabulary

## Instructional Delivery

### Pre-Assessment/Introduction:

Led by Arlington Echo staff at the Main Pavilion

### Lesson Setup:

Gather resource materials located in the Forest Pavilion chest. Planters and materials for planting should all be laid out at a picnic table under the Forest Pavilion.

## Engage:

### Motivation/Warm up:

1. Students should arrive at the Forest Pavilion. Instructor will introduce the students to the lesson. Tell the students, **“Here we will explore two different roles that living trees, specifically Atlantic White Cedars, play in supporting the Chesapeake Bay Watershed.”** (*Nutrient filtration and erosion control.*)
2. Open a root-bound, small-potted Atlantic White Cedar and examine its roots or view the roots of the tree through an acrylic glass and cedar planting box. Have students describe what they see. Ask the students the following questions:
  - **What is the purpose of these roots?** *To absorb water and nutrients.*
  - **In what ways do you think this process is helpful to the forest ecosystem?** *Filtration of nutrients, soil stabilization/erosion control.*
3. Show students a sample carbon fish tank filter and discuss filtration.
4. Ask the students how humans have affected this process, positively and negatively, in the past and how we can have a positive impact in the future.
5. Discuss algae blooms and how they are formed. Show the students a picture of an algae bloom.
6. Have the students do an action/planting project (to be announced at training).

## Explore:

### Roots – Part 1

1. Have the students sit on the benches and survey the area around them. Ask the students the following questions:
  - **What is significant or unique about this section of the forest?** *Dead, rotting trees.*

- **Are these examples of living or dead trees?** *Dead. How do you know?* *Missing leaves, branches, bark, or the trunks of the trees are hollow with holes.*
  - **What are some things that might kill a tree?** *Old age, sickness, insect attack, fire, lightning, or wind.*
  - **Do dead trees provide habitat? What do you observe?** *Woodpecker holes, insect holes.*
2. Explain that eventually a dead tree falls down. Have students observe a log on the ground. If the roots are visible, show the roots to the students. Ask the students to explain the function of roots in a living tree. *Take in water, help tree stand up.* Ask the students, **“What do humans often do with fallen trees soon after they hit the ground, especially around our homes?”** *Remove and cut them up for firewood.*
  3. Explain that the fallen log is a home for many plants and animals. Use picture cards to show students what might grow on a log. Allow students to look for moss, lichen, mushrooms or other fungi.
  4. Ask students to examine fallen logs around them and find evidence of habitat. Have them look for small holes that termites, ants, bees and other insects (“bugs”) may have made for their homes and large holes that woodpeckers may have made searching for bugs to eat, as well as creating cavities for nesting.
  5. Roll over a dead log and allow students to look under it. Look for living things or signs of living things (holes, tunnels, saw dust). Replace the log. Tell the students to replace any logs they roll over because this is the habitat of insects and other living things.
  6. Have students look for their own insects and other living things. Students should use hand trowels to move the leaf litter aside and explore on the logs and under the dead logs. They can collect what they find with the bug boxes and use the hand lenses to observe (see identification sheet provided.) Rules for collecting:
    - **Leave spiders in place. Do not touch or collect them.**
    - Invite students to handle earthworms gently.
    - Other living things may be scooped up with trowels and placed into trays for observation. If possible, identify what the students find.
    - Everything should be placed back in the general location of where they were found after everyone gets a chance to look at the insects.
  7. Have students share their findings.
  8. Ask students to describe the soil under the log (look, feel, smell). Many living things need this damp (wet) place to live.
  9. Have students return the living things to the soil and push the leaf litter back into place when they are done observing.
  10. Look into the Terrarium to see insects if they do not find any under logs on the ground.

### Explain:

Ask students to explain why these living things are here:

- Explain that the log is their habitat (home or shelter). Their food is here, too. Discuss the eggs—they also reproduce here.
- Some things are eating the log and leaves. They are recycling the log and leaves back into the soil when they poop. They are helping to break the log into smaller and smaller pieces. The pieces become part of the soil. Another way to say this is that the log is being decomposed.
- This shows the cycle of nutrients, or food web and how energy can be transferred between each cycle of life. Show student the decomposers food web **(Supplement )**
- Ask students why arrows are pointed from the animals to the decomposers. *Decomposers break down organisms and return the nutrients to the soil.*
- Show other fallen logs to students. Have them compare the logs. Ask them which has decomposed the most. Ask what will happen to the logs after a very long time. *They will decompose and become part of the soil. You won't be able to see them anymore.*

### Elaborate

#### Roots - Part 2

1. Tell the students that trees not only provide roots to stabilize soil and filter nutrients, but they also provide other things as well.

2. Take students out from under the Forest Pavilion, into the open.
3. Have the students sit in silence for 30 seconds. Encourage them to take in their surrounding by listening, smelling, and looking around and up. Have the students share what they observed.
  - Be sure to look up at the canopy. Is there evidence of animals in the trees? What are they doing? *Making homes, finding food, storing food, etc.*
  - Are there other plants living on the trees?
  - What do trees provide? *Shade, shelter, oxygen, soil stabilization, filtration, habitat.*
4. Ask students to guess how many breaths of oxygen they take per day. *The average person takes 20,000 breaths per day.*
5. Using the measuring tapes, have students pick a tree and measure its circumference (distance around its trunk) at the height of their shoulders. Use the graph to discover how many breaths of oxygen the tree gives each day! Have them mark it on the graph in the journal.
6. Discuss how humans are impacting the world's forests, positively and negatively, and how we can make a positive impact in the present and future.

### [OVERNIGHT ONLY – SEDIMENT, SEDIMENT FIELD GAME]

1. Line students up along one side of the area blocked off by cones. Explain that the blocked-off area represents the Chesapeake Bay Watershed, the side of the cones where they are standing represents a forest in the watershed, and the opposite side represents the Chesapeake Bay. Further explain that each one of them represents a piece of sediment in the forest floor.
2. Explain that when you say a form of precipitation (rain, snow, drizzle, etc.) they will run to the other side of the watershed. This represents the water from the precipitation event flowing through the forest, picking up pieces of sediment along the way, flowing through the watershed, and releasing the sediment into the Chesapeake Bay.
3. Let the students run through the watershed once. Ask the students: **“Was it easy for you, as a piece of sediment, to get all the way from the forest to the Chesapeake Bay?”** *(Yes!)* **“How long did it take you to reach the Bay?”** *(Not very long.)* **“Is there anything we can do to slow down sediment or keep it from reaching the Bay?”** *(Plant trees!)*
4. Assign one student to be a tree planter. Explain that this student will stand in the middle of the watershed and tag other students as they run by. If a student is tagged, they become a tree and they must stop running and stand where they are. Once students become trees, they can tag other pieces of sediment running by, and they will also become a tree.
5. Have the students run through the watershed again, this time while the tree planter tries to tag the pieces of sediment. Complete multiple rounds. Each time, it will be harder for the pieces of sediment to reach the Bay. Finally, there will be no more pieces of sediment running through the watershed.
6. Explain that this simulation represents what can happen in the Chesapeake Bay Watershed: if more people plant trees across the watershed, this will help hold the soil particles in place and reduce erosion, ultimately lessening the amount of sediment that washes into the Bay.

### Evaluation: Discussion Questions (Supplement A)

Ask the students the questions found in Supplement A and discuss their answers, ensuring that they understand the importance of forests and the role that forests play as nutrient sinks and as erosion reducers.

### Notes for clean up:

Please clean, organize and return the lesson materials to their proper locations at the end of the day of instruction. Remember to inform the Arlington Echo staff if you need assistance or if any materials are damaged or missing.

### Notes for inclement weather:

Arlington Echo encourages keeping our outdoor activities outdoors whenever possible, even in the rain. In the case of severe weather (thunder, extreme cold, etc.), The Forest Around Us activity will remain under the Forest Pavilion.



## Supplement A: Information on Forests

### Forest

What is a **forest**? A forest is a dense growth of trees, plants, and underbrush covering a tract of land. Most forest floors are covered with the debris of fallen branches and trunks of trees. These scattered logs and branches undergo the process of **decomposition**, or the process of breaking down organic material, such as dead plant or animal tissue, into smaller molecules that are available for use by the organisms of an ecosystem. Decomposition is accomplished by a wide variety of decomposers, such as bugs, mushrooms, worms and bacteria, which act as **nature's recyclers**, recreating soil. When a tree dies, decomposers chow down on the dead bark and leaves and turn that old tree into soil, which allows new plants to grow. Humans exercise a major impact on forests when they cut trees down or remove fallen logs and haul them away to make paper or firewood, leaving decomposers exposed in the hot sun with very little to eat, resulting in the death of their populations.

### Nutrients and Trees

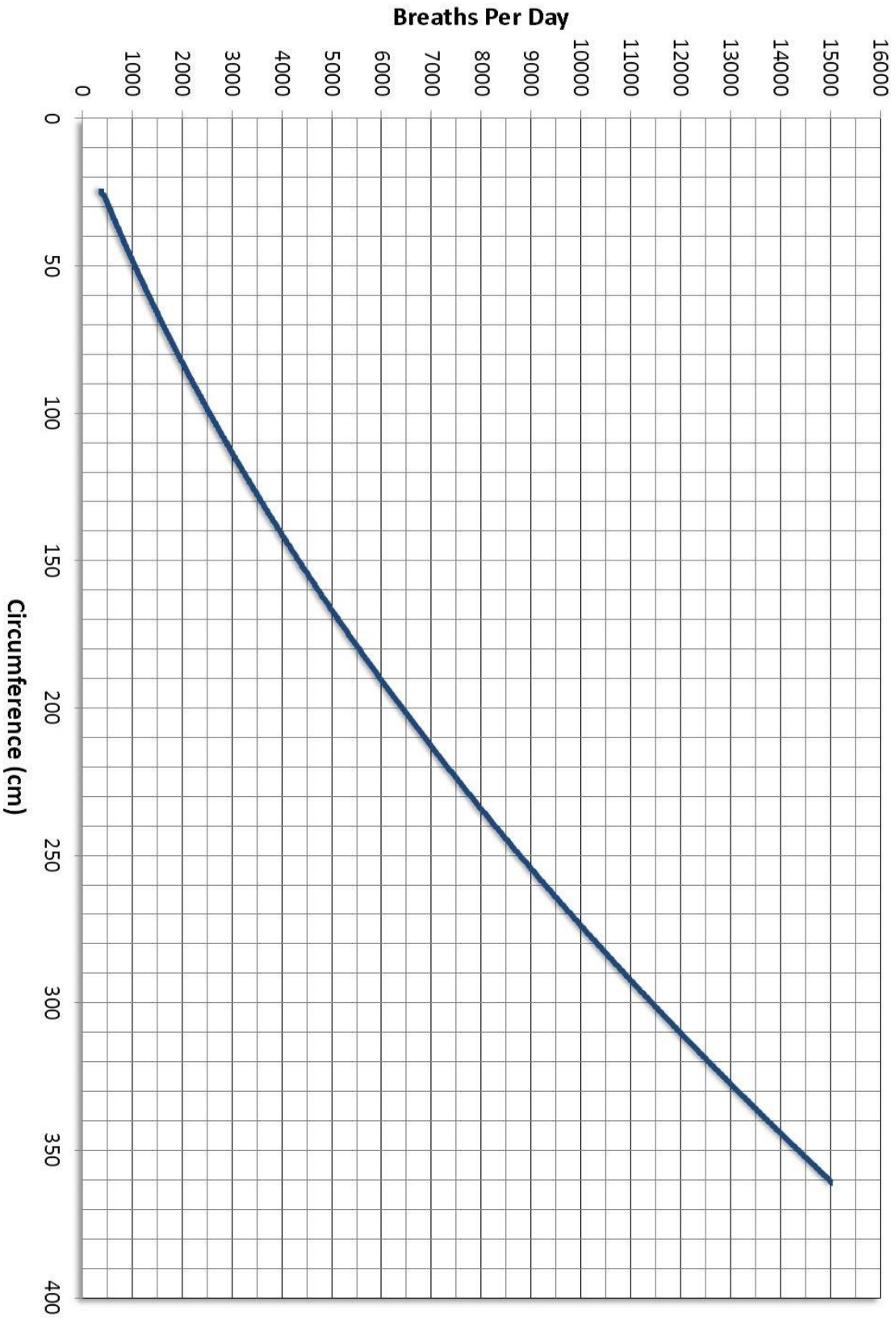
The roots of the trees in a forest, particularly those of the Atlantic White Cedar tree, perform two major functions. They anchor the tree into the ground and they absorb water and **nutrients**, which the tree uses in the process of **photosynthesis**, through which plants use the energy from sunlight to produce sugar, converting that into ATP, the "fuel" used by all living things. The root anchoring mechanism prevents soil erosion and, consequently halts the flow of sediment into our streams, creeks, rivers, and, eventually, the Chesapeake Bay. The root systems of the trees are actually comprised of both living and dead matter, which absorbs the aforementioned nutrients, as well as pollutants, from storm water runoff. The dead roots form a dense carbon mass under the tree. The primary **nutrients** absorbed by this system are phosphorous and nitrogen, which are found in fertilizer, animal waste, air pollution, and leaking septic tanks and wastewater plants. These are the very nutrients that feed the algae in the bay and eventually cause large algae blooms, blocking sunlight from reaching the Submerged Aquatic Vegetation (SAV's), or bay grasses, leading to dead zones, where nothing can survive. In short, these root systems act like the carbon filters that people place in their fish tanks to control the growth of algae.

### Oxygen

One byproduct of photosynthesis is the release of **oxygen**, which we must have to stay alive. The chlorophyll, or green pigment, found in the tree's leaves, is necessary to the process of photosynthesis. Looking up into the tree **canopy** (upper layer or habitat zone), the green leaves can be clearly seen. A fascinating recent discovery is that a person can actually determine how much of their human oxygen needs are being provided by a tree by measuring its **circumference** (the perimeter or distance around the edge of a circle) at approximately an adult's chest height. Trees supply 15-20% of the Earth's oxygen. Estimates for oxygen production by phytoplankton in the ocean range from 20% to 50%.

Supplement B: Tree Breaths Per Day chart

The Forest Around Us  
How Many Breaths of Oxygen a Tree Produces in a Day



## Supplement C: Discussion Questions

- **What do you call the forested area that protects the river?**
  - *Forest Buffer*
- **What is the transition area called where the water meets the land?**
  - *Wetland*
- **What do the roots of trees, particularly Atlantic White Cedars, do to prevent algae blooms from forming in the Chesapeake Bay?**
  - *They filter nutrients out of the water in the soil and prevent it from reaching the Chesapeake Bay. The presence of excess nutrients in the Chesapeake Bay provides algae with the resources it needs to grow. Excess algae growth in the Chesapeake Bay prevents sunlight from reaching other plants, such as submerged aquatic vegetation (SAVs), which are vital habitats for many organisms.*
- **How do dead trees play a role in the life cycle of the forest?**
  - *They provide homes for birds, insects, and other organisms. Decomposers recycle dead logs are recycled back into the earth so that the nutrients can be reused by other plants.*
- **Trees and photosynthesizing plants produce oxygen. What do humans do with oxygen?**
  - *We breathe in oxygen.*



## Supplement D: Vocabulary

**Atlantic White Cedar:** A tall evergreen tree native to swamps and coastline in Maryland, Virginia, and Delaware.

**Cache:** A hiding place to preserve small items.

**Canopy:** The upper layer or habitat zone of trees.

**Chlorophyll:** Green pigment found in the leaves of trees.

**Circumference:** The distance around the edge of a circular object.

**Compass:** An instrument that contains a magnetized pointer and shows the direction of magnetic north and bearings from it.

**Decomposition:** The process of breaking down organic material, such as dead plant or animal tissue, into smaller molecules that are available for use by the organisms of an ecosystem. Accomplished by a wide variety of decomposers, such as bugs, mushrooms, worms and bacteria.

**Forest:** A dense growth of trees, plants, and underbrush covering a tract of land.

**Habitat:** The natural home or environment of an animal, plant, or other organism.

**Nutrients:** Small particles absorbed by the root systems of trees to help them grow. The primary nutrients for trees are phosphorous and nitrogen, which are found in fertilizer, animal waste, air pollution, and leaking septic tanks and wastewater plants.

**Nutrient Sink:** A habitat that serves to trap nutrients where they accumulate and are stored for a long period of time.

**Orientation:** The determination of the relative position of oneself or of something.

**Photosynthesis:** The process through which plants use the energy from sunlight to produce sugar, converting that into ATP, the "fuel" used by all living things.