

# Standing Tall at Cheekwood: Trees and Communication

Focusing on the Cheekwood Arboretum (70 minutes) - Grades 4 & 6

## About

During this lesson, students will learn all about trees. They will learn about the invasive species, the Emerald Ash Borer. They will learn about how this invasive species affects ash trees in Middle Tennessee. Then, students will learn about how a forest ecosystem is centered around the trees that live there. In addition, students will explore how trees talk to one another through underground fungi. Students will leave this lesson with a more in-depth understanding of the role that trees play in our world, and why it is important for humans to help protect and take care of them.

## Objectives

1. Students will learn about the Emerald Ash Borer and how it affects trees in Middle Tennessee.
2. Students will learn about how trees are a vital part of our ecosystem and food web.
3. Students will learn about how trees communicate.

## Background on the Cheekwood Arboretum

### Arboretum Accreditation

The Arboretum at Cheekwood was first awarded a Level 1 accreditation with the regional organization, Tennessee Urban Forestry Council (TUFC), in 2001. By 2010, after substantial program enhancements, a Level 4 status was awarded. In late 2020, The Cheekwood Garden Team decided to set their sights a bit wider and applied for recognition with the global organization, ArbNet. Earlier this year, Cheekwood was awarded a Level 2 status by the ArbNet Arboretum Accreditation Program and Morton Arboretum.

The first two requirements which qualified Cheekwood for a Level 2 standing with ArbNet included satisfying all Level 1 qualifications and displaying a minimum of 100 species of trees or woody plant varieties. The garden team was also required to submit an arboretum collections policy to describe the development and professional management of the plants in the arboretum collection. Another important qualification for Level 2 accreditation was having at least one arboretum employee whose job responsibility is to specifically manage or operate the arboretum. Lastly, it was important to show that Cheekwood provides enhanced educational and public programs related to trees.

Namely, the arboretum collection is one of the most comprehensive and unifying features of Cheekwood's offering, providing a logical way to explore the estate and gardens. Three primary tree collections include the Nationally Accredited Cornus Collection™, the historic collection, and trees native to the southeastern United States. The dogwoods weave together a series of distinct gardens organized along the property's eastern ridge, which ends at the base of the Historic Mansion & Museum, the foot of the property's historic core. The historic landscape is embraced by a woodland sculpture trail, a fourteen-acre successional forest that serves as the primary venue for the native tree collection.

## Cornus Collection

Extending throughout Cheekwood, from the Carell Dogwood Garden to the Ann & Monroe Carell Jr. Family Sculpture Trail, the estate currently features more than 300 individual dogwoods. Both tree and shrub forms are celebrated within the arboretum. With over 14 different species and 23 various varieties, dogwoods supply interests for all four seasons.

Becoming a Nationally Accredited Collection with the American Public Garden Association's Plant Collections Network's in 2012, enhancing the dogwood collection continues to be a significant collecting mission. Cheekwood's dogwood collection remains the only one of its kind to be recognized by this organization. The gardens team stays informed about new cultivars and improved breeding of Cornus as it is part of our objective to keep the public informed about development of the genus.

Cheekwood's arboretum serves the community as an outdoor classroom for young and old, as well as for locals and those just visiting. It is a place that provides introspection and connectivity, strengthening our physical and mental health. Cheekwood strives to maintain and enhance the tree collections, keeping their interpretation fresh and educational. As both a botanical garden and arboretum, it is our mission to always provide something new to explore, appreciate, and astonish, while preserving that which is historically sacred.

Stop by Visitor Services or download our arboretum map [here](#) to help you identify the 2,100 trees throughout our gardens.

## Vocabulary

Arboretum – A botanical garden is a garden devoted to growing a collection of trees for scientific and educational purposes.

Botanical Garden – A botanical garden is a place dedicated to the collection, cultivation, preservation, scientific study, and display of an especially wide range of plants.

Consumer – Consumers eat producers or other consumers to survive. Deer are consumers that are herbivores, which means that they only eat plants (producers). Bears are consumers that are omnivores and scavengers, like skunks and raccoons, which means that they will eat just about anything, like bugs, acorns, and fruits.

Decomposer – Decomposers are organisms that break down all the dead animals and plants (consumers and producers) into their nutrient components (organic material) so that plants can use them to make more food. Decomposers in the forest come in many different shapes and sizes such as fungi, bacteria, worms, and insects.

Ecosystem – An ecosystem is a community of organisms and their physical environment interacting with each other. Ecosystems contain living and nonliving organisms that are linked together through cycles of energy and nutrients.

Emerald Ash Borer – The emerald ash borer, also known by the acronym EAB, is a green buprestid or jewel beetle native to north-eastern Asia that feeds on ash tree species. Females lay eggs on ash trees in crevices of their bark while larvae feed underneath the bark of ash trees and emerge as adults in one to two years in turn killing the tree.

Forest Ecosystem – A forest consists of both living and nonliving things such as trees, animals, plants, soil, water, air all working together to make up a forest ecosystem. This system is dominated by trees growing in a closed canopy and undergrowth.

Food Web – A food web consists of all interdependent food chains in an ecosystem. Each living thing in an ecosystem is part of multiple food chains. Each food chain is one possible path that energy and nutrients may take as they move through the ecosystem.

Invasive Species – An invasive species is an introduced, nonnative organism (disease, parasite, plant, or animal) that begins to spread or expand its range from the site of its original introduction and that has the potential to cause harm to the environment, the economy, or to human health.

Producer – Producers are organisms that create their own food or energy. Green plants make their food by taking sunlight and using the energy to make sugar. The plant uses this sugar, also called glucose, to make many things, such as wood, leaves, roots, and bark. Trees, such as they mighty Oak, and the grand American Beech, are examples of producers.

Species Endangerment – An endangered species is an organism that has become so rare that it is in danger of becoming extinct or no longer in existence throughout all or a significant portion of its range. Threatened species are plants and animals that are likely to become endangered within the foreseeable future.

Tree Communication – All trees are connected to each other through underground fungal networks known as mycorrhizal networks. Trees share water and nutrients through these networks and use them to communicate with one another. They send distress signals about drought and disease, for example, or insect attacks, and other trees alter their behavior when they receive these messages.

## Standards Covered

### 4.LS2: ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

- 2. Develop models of terrestrial and aquatic food chains to describe the movement of energy among producers, herbivores, carnivores, omnivores, and decomposers.
- 3. Using information about the roles of organisms (producers, consumers, decomposers), evaluate how those roles in food chains are interconnected in a food web, and communicate how the organisms are continuously able to meet their needs in a stable food web.
- 4. Develop and use models to determine the effects of introducing a species to, or removing a species from, an ecosystem and how either one can damage the balance of an ecosystem.

### 6.LS2: ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

- 1) Evaluate and communicate the impact of environmental variables on population size.
- 2) Determine the impact of competitive, symbiotic, and predatory interactions in an ecosystem.
- 3) Draw conclusions about the transfer of energy through a food web and energy pyramid in an ecosystem.
- 5) Analyze existing evidence about the effect of a specific invasive species on native populations in Tennessee and design a solution to mitigate its impact.
- 6) Research the ways in which an ecosystem has changed over time in response to changes in physical conditions, population balances, human interactions, and natural catastrophes.



## Pre-Visit

For the pre-visit, there will be a virtual meeting that will happen between a Cheekwood staff member and the class. There will be a PowerPoint that is shared about Cheekwood's history and a brief introduction on what students will be learning during their Cheekwood visit. This introduction will include showing the video linked below that begins the conversation about tree communication.

[https://www.youtube.com/watch?v=7kHZOa\\_6TxY](https://www.youtube.com/watch?v=7kHZOa_6TxY)

## Overview of the Day

1. Students will start off at the Frist Learning Center where they will unload from the bus and be greeted by a Cheekwood educator. The educator will give an overview of the guideline's students should follow while at the garden and briefly review the material covered during the pre-visit activity.
2. Teachers will already have students preassigned to 3 different groups. Students will proceed to their different stations. The educators/docents will be preassigned to one of the stations listed below, each starting at a different one. Each activity will last approximately 20 minutes.
  - a. Invasive Species (20 minutes)
    - i. This station will be about the emerald ash borer.
      1. Students will learn about the Emerald Ash Borer and the damage it causes. Students will look at Emerald Ash Borer specimens and pieces of ash trees that have been affected. They will complete a worksheet that is a comprehensive overview of the Emerald Ash Borer.
  - b. Trees and the Ecosystems They Live In (20 minutes)
    - i. This station is all about how a food web in a forest ecosystem is centered around trees and other plants. At this station, students will learn further about a forest food web and how the energy moves through it. They will learn what will happen if a part of the food web is removed, this will be demonstrated through a game they will play.
  - c. Tree Communication (20 minutes)
    - i. This station will be about how trees communicate with one another. Students will have already been introduced to tree communication during their pre-visit, a recap of how trees communicate will be discussed before moving into the game. Students will play a game of charades mimicking tree communication. There will be a stress agent placed on a tree, and then the tree will have to communicate only through actions/body language to the other trees what is happening. Students will then try and guess what the stress agent is.

## Post-Visit

The post visit for this field trip includes each student on this trip receiving a grade appropriate book about trees, Listen to the Language of the Trees: A story of how forests communicate underground by Tera Kelley. It also includes the option to have a native tree planted at their school by Cheekwood Education staff.



Students will also be encouraged to go outside at their school, park, or even their neighborhood, and work to identify the different trees that are growing around them. After identifying the trees around them, students will look to see if there are any pests, diseases, or signs of distress on/coming from the tree.

### **Post-Visit Book Suggestions**

Can You Hear the Trees Talking?: Discovering the Hidden Life of the Forest by Peter Wohlleben

Lesson creation resources:

Project Learning Tree: Environmental education for PreK-8