



## **Standing Tall at Cheekwood: Trees and Communication**

*Focusing on The Cheekwood Arboretum (90 minutes) – 6<sup>th</sup> Grade*

### **About**

During this lesson, students will learn all about trees and the different ways they are affected over the course of their existence. Students will specifically learn about invasive species that commonly affect trees, human impact on trees through the lens of weather change, and then how trees communicate these different changes to one another. Students will leave this lesson with a more in-depth understanding of the roles 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 invasive species that harm and kills trees here in Middle Tennessee.
2. Students will learn about human impact on the environment and how Tennessee temperatures and rainfall are affected. Then, students will learn how these changes will affect the ecosystems that exist in Tennessee while specifically focusing on how it will affect trees.
3. Students will learn about how trees communicate. Then, students will practice tree communication with a game of charades.
4. Students will learn why trees are crucial to our world, and how trees can be planted and conserved to help combat human impact.

### **History about 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.

### **Vocab**

**Botanical garden** - A botanical garden or botanic garden is a garden dedicated to the collection, cultivation, preservation, and display of an especially wide range of plants, which are typically labelled with their botanical names.

**Arboretum** - a place where trees and plants are grown for scientific and educational purposes

**Ecosystem** - a system made up of an ecological community of living things interacting with their environment especially under natural conditions

**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.

**Human impact** - Human impact on the environment refers to changes to biophysical environments and to ecosystems, biodiversity, and natural resources caused directly or indirectly by humans.

**Climate** - the average weather conditions of a particular place or region over a period of years

Climate change – the long-term changes in global temperatures and other characteristics of the atmosphere. Climate has changed throughout Earth's long history, but this time it's different. Human activity is causing worldwide temperatures to rise higher and faster than any time we know of in the past.

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 species. Females lay eggs in bark crevices on ash trees, and larvae feed underneath the bark of ash trees to emerge as adults in one to two years.

Southern Pine Beetle – the Southern Pine Beetle (SPB) is one of the five common species of pine bark beetles that occur throughout the Southeastern United States. Pine bark beetles utilize stressed, dying, or recently dead pines as hosts. All species tunnel, reproduce, and feed in the inner bark or phloem (located between the outer bark and wood); this activity disables the transport of sugars through the tree. In addition, several bark beetle species introduce a blue-stain fungus in the wood, plugging the tree's water transport system. Typically, pines successfully colonized by SPB

Tree communication – also referred to as the, “wood-wide web,” all trees are connected to each other through underground fungal networks known as mycorrhizal networks. Trees share water and nutrients through the networks, and use them to communicate. They send distress signals about drought and disease, for example, or insect attacks, and other trees alter their behavior when they receive these messages.

Species endangerment - those plants and animals that have become so rare they are in danger of becoming extinct. Threatened species are plants and animals that are likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

## **Standards Covered**

### **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.
- 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.

### **6.ESS3: Earth and Human Activity**

- 3) Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction.

**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 student's 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=7kHZ0a\\_6TxY](https://www.youtube.com/watch?v=7kHZ0a_6TxY)

## **Overview of the Day**

1. Students will start off at the Frist Learning Center where they will have just gotten off their bus. As soon as students are off the buses, a quick movement activity will be lead. Then, there will be an overview of the guidelines we ask students to follow while they are here. (10 min)
2. Next, students will be lead through a predetermined section of Cheekwood's arboretum. During this guided tour, students will learn about some of the trees in Cheekwood's collection, and why trees are valued and studied here at Cheekwood and why trees are important to the world. (20 minutes)
3. Then, students will proceed to their different stations. Docents will already be preassigned to a different station to start. The docents will be assigned to one of the starting points listed below. (each activity will be 15 minutes with 3 minutes for transitions between stations):
  - a. Diseases and pests (15 minutes)
    - i. This station will be about the emerald ash borer and the southern pine beetle. They will also talk about powdery mildew as a disease that affects trees.
      1. Students will learn about each invasive pest and the damage it can cause. Then, students will look at maps comparing the spread of the pest when it was first identified to what it looks like today.
      2. Then, students will play a game:
        - a. This game is to show how pests can easily and quickly spread from place to place. Students will begin near Detroit where the Emerald Ash Borer was first discovered in the United States. The students will act like they are going camping somewhere in the United States, but before they leave, they load their care with firewood from the backyard. Then, each student will choose somewhere in the United States to go camping. Each student will be given 10 cards from a deck of cards, number of decks depends on size of group, and anyone that has ace has brought the Emerald Ash Borer with them in their firewood. Students that have an ace will then raise their hand.
        - b. After this game, students will discuss what will happen if an Emerald Ash Borer finds an ash tree. They will also discuss how this would happen with the Southern Pine Beetle. From this game, students will learn how quickly invasive pests can spread and why it is important to not bring firewood from place to place.
  - b. Human Impact (15 minutes)

- i. This activity will be about how the climate here in middle Tennessee has changed over time by looking at graphs of the temperature and precipitation change. Then, after noting these changes, students will learn about how these changes affect the native trees that grow here in middle Tennessee. They will look at the temperature requirements and water requirements and determine if these trees are still able to grow and thrive in this environment. Then, students will brainstorm how these changes in weather will affect the many ecosystems that exist in middle Tennessee.
- c. Tree communication (15 minutes)
  - i. This station will be all about tree communication. Students will have already been introduced to tree communication during their pre-visit, so a recap of how trees communicate will be discussed before moving into the game. Then, students will play charades. There will be a stress agent placed on a tree, and then that 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**

As the post visit for this lesson, students will 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. Documentation of these findings can be kept in the booklet template provided in the post visit resource center.

### **Post Visit Book Suggestions:**

Good Morning Trees: A journey in learning about climate change and how to make a difference

By: Aisha Nnoli

Climate Change (And How We'll Fix It)

By: Alice Harman

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

By: Peter Wohlleben

Listen to the Language of the Trees: A story of how forests communicate underground

By: Tera Kelley