Magnolia Collection Self-Guided Walk
Grades 5-12

This self-guided walk aligns to the following Next Generation Science Standards (NGSS)

- **5-LS1-1.** Support an argument that plants get the materials they need for growth chiefly from air and water.
- **MS-LS4-1.** Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- **MS-LS4-4.** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- **MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- **HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Prior to your trip:

- **Logistical Prep:**
  - Review the Arboretum’s map and field trip prep materials. This includes the chaperone field trip letter, group planning document, and self-guided information letter.
  - Determine your content goals for the trip. Do you want them to take photos of what they see? Do you want them to collect information or notes?
  - Determine your route. Based on the plans for your day, be sure to map out where you want to visit. For the magnolia collection, you can hike from the Visitor Center and park in Parking Lot 1 (the main lot) OR you can park near parking lot 5 or 8, depending on the size of your vehicles(s). Chart your hike, and consider bus parking, lunch, and other parts of your day. Lunch space is not reserved, but the map identifies several picnic locations where your group can stop to eat.

- **Curriculum Prep/Activities**
  - Review your expectations for the trip. Show students what they will do during the trip. Outline your goals and what you want them to do or collect while they are onsite.
  - Familiarize your students with the Arboretum. Get to know the Arboretum before your visit. View our online exhibits through Google Cultural Institute: [https://www.google.com/culturalinstitute/beta/partner/the-morton-arboretum](https://www.google.com/culturalinstitute/beta/partner/the-morton-arboretum)
    - Can you imagine a world without trees?
    - What is an Arboretum?
    - Great Trees
  - Pre-Reading Activity. Learn more about the evolution and history of magnolias with this article from the New York Times.

Day of Your Field Trip:

- Arrive with time to travel to the start your hiking location. The Arboretum contains 16 miles of trails and 9 miles of roads. Transportation on the property to different locations can take up to 20 minutes.
- At the gatehouse entrance, indicate the name of your school or group. It is recommended that you also bring a copy of your confirmation statement.
- Once you have arrived to your hiking location, unload and divide into groups. Use this hiking guide to prompt your students with questions and observations as they encounter the magnolia exhibit.

Following Your Trip:

- Determine how you want students to summarize their learning.
Note: Hiking the magnolia collection takes between 10-15 minutes. You may want to combine this self-guided walk with the Vanishing Acts Exhibit, Crab Apple Collection, or other self-guided hikes.
Magnolia Collection
Self-Guided Walking Guide

Note: This hike can be completed at either end of the path through the collection. However, it is written to start closest to Parking Lot 5. If you are starting from the West end of Main Loop 1, you may want to start with Living Fossils after reviewing the Magnificent Magnolia Section.

Magnificent Magnolias
1. At all times of the year, trees in the magnolia family have unique characteristics and structures that you can observe. Magnolias are some of the oldest flowering trees. They have structures and adaptations that have stood throughout the test of time and allowed them to survive the somewhat harsh climate of the last million years.
2. Look at some of the specimens just off the path. Observe their unique buds, leaves, and flowers (if visible).
   a. What unique features do you notice?
   b. How do they compare to other trees in your schoolyard or home?
   c. Describe their shape, leaf size, and bark. Record these findings with either a camera or in a notepad.
3. Buds. Look at the buds of the magnolia trees. If flowers are visible, look at the side of the flower to find the fuzzy petal that once encapsulated the flower.
   a. What do you observe about the bud texture? Size?
   b. Pictured to the right is the bud of a Magnolia “Blushing Bell.” This fuzzy bud is composed of bracts (modified leaves). Most flower buds are surrounded with sepals, which are modified petals. Magnolias have this unique leaf structure which helps protect the flower throughout the winter. Buds on many magnolias are visible in the fall and winter, and magnolias are some of the first to flower in the spring.
4. Flowers. As some of the most ancient flowers, magnolias have unique structures that showcase what pollination looked like before bees evolved. Magnolias are pollinated by beetles instead of bees.
   a. Feel the petals if the flowers are available. (Please do not pick or remove them.)
   b. Do they feel thinner or thicker than other petals you are familiar with? (Daisy, rose, etc.)
   c. Since magnolias are pollinated by beetles, their petals are thick to protect from the beetles’ thorny legs and mandible chewing parts.
   d. What else do you notice about the flower? What structures can you see from the inside parts? Make a note or take a picture of what you can see. If flowers are not visible, look at the photos below.
Magnolia Collection Self-Guided Walking Guide Overview

e. Magnolia Pollination – Look at the diagram comparison:

![Diagram of Magnolia vs Rose Flower Parts]

- **Magnolia** (primitive flower)
  - Sepal/petal
  - Pistil(s♀)
  - Anther(s♂)

- **Rose** (moderately evolved flower)
  - Petal
  - Stigma
  - Anther(s♂)

f. Review the diagram and discuss how the magnolia’s flower parts are designed for pollination. Beetles climb from the petals and up the anthers to the pistil in search of nectar. In their search they also pollinate the pistil. If flowers are visible, you can observe the protruding pistil structure and surrounding anthers. Record your observations with either a camera or notepad.

5. **Leaves.** Magnolias have oblong leaves that range in length from 5 to 10 inches, based on variety/species.
   a. They have a long, central vein with smaller veins that radiate from the center vein.
   b. Additionally, some leaves are waxy/shiny while others have a dull/matte texture. The undersides of the leaf (from common magnolia species) are gray or brown in color. (See example below.)
   c. The waxy, thick texture of Magnolia grandiflora allows the tree to keep its leaves for up to 2 years in warmer climates.

   ![Magnolia Leaves Examples]
   - (Top side of Magnolia grandiflora)
   - (Underside of Magnolia grandiflora)

   Headborn, Edward Jr. 2013

   d. Leaves of magnolias have been used traditionally for wreathes and in decorate designs throughout the southern United States.
A Living Seed Bank
1. Magnolia trees, often favored for their large blooms, are under threat of disappearing. The magnolia family of trees has over 245 species, of these 131 of them are under threat. (That is more than half!)
2. Conservationists, public gardens, and arboretums all over the world are hoping to protect magnolias by keeping a vibrant healthy seed bank in their living collections. The trees you see in this collection are an example of this work in action.
3. Review the letter located on the “Living Seed Bank Panel.”
   a. What did you learn about the pyramid magnolia and its origin?
   b. How are seeds preserved?
   c. Why are living collections important?
4. Observe the seed head/structure. What do you notice about the seeds? How does the seed head look similar to the flower (or its parts)? How do you think its seeds are dispersed? (Dispersal by birds)

Family Trees
1. Magnolias are often times cultivated (bred or manipulated) by tree and plant breeders to create new varieties with traits of both the parent plants. To do this, researchers and breeders will take pollen from one species and introduce it to the species of another. The end goal is a cultivar—or new plant—that is the same species but has traits of both its parent plants. Related species of magnolias can create new varieties in the wild, but often times researchers and breeders will create new cultivars to make smaller trees with the desirable traits of the parent plants (flower color, size shape, leaf color, size shape etc.).
2. Read through the cultivar example on the “Family Trees Panel” for an example.
3. Then read through the example below and make a prediction about the new cultivar’s features.
<table>
<thead>
<tr>
<th>Parent 1: Magnolia Liliiflora</th>
<th>Parent 2: Magnolia Sprengeri ‘Diva’</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leaves</strong></td>
<td></td>
</tr>
<tr>
<td>10-18 cm long, dark green slender in shape</td>
<td>15 cm long, dark green, slender with some hairs on the underside</td>
</tr>
<tr>
<td><strong>Flowers</strong></td>
<td></td>
</tr>
<tr>
<td>Dark pink to purple leafy flowers that emerge before the leaves. Flowers are upright and contain 9 sepals/petals. Exterior of the flowers is purple/pink, interior is white</td>
<td>Large, rose-pink flowers that are saucer-shaped and contain 14 petals/sepals</td>
</tr>
<tr>
<td><strong>Overall Size</strong></td>
<td></td>
</tr>
<tr>
<td>(Small) 2 to 4 meters tall, shrub-like appearance</td>
<td>(Medium) 5-15 meters tall. Tree-like, not shrub-like</td>
</tr>
<tr>
<td><strong>Other Notable Features</strong></td>
<td></td>
</tr>
<tr>
<td>Multi-stem</td>
<td>Pale gray/brown to black bark with shaggy appearance. New twigs are pale yellow/brown</td>
</tr>
</tbody>
</table>

NEW cultivar prediction:

Note: Galaxy Magnolia is a result of the cross between a Magnolia Liliiflora and a Magnolia Sprengeri ‘Diva’. Below is an image of the tree in bloom. **How close were your predictions?**

Grows 9-12 meters tall
Flowers contain 12 sepals/petals
Leaves are oblong & dark green
Magnolia Collection Self-Guided Walking Guide Overview

Living Fossils
1. Magnolias are some of the oldest flowering trees/plants on the planet.
2. Review the “Living Fossils” Panel. Then review the timeline of tree evolution and common ancestry for today’s flowering plants. Think about the following questions:
   a. What structures took priority for early plants? (structures for water absorption and preventing water loss which was critical for photosynthesis as plants evolved on land)
   b. Why do you think this is the case? (Evolution as plants moved to land)
   c. How does plant evolution change over time?
   d. What types of animal species/evolution would you suspect to find alongside the plant evolution? How are they dependent and independent of each other?