

Mesker Park Zoo & Botanic Garden  
S.T.E.A.M.  
Wild About Trees (Dendrology 101)

## S.T.E.A.M.

It is important that young minds are exposed to the environmental issues in today's world because they will be the leaders of tomorrow. By participating in Mesker Park & Botanical Garden's STEAM (Science, Technology, Engineering, Art, & Math) activities at the zoo, children will be able to gain new knowledge and skills that will not only help them succeed in school, but get them excited about learning. These activities are designed to be interactive and most importantly fun.

## DENDROLOGY

Dendrology is the scientific study of woody plants; most commonly trees. This is an important field of study since trees hold a lot of information about evolution and that they are essential for life on Earth. We breathe the air they produce and use their wood for a variety of activities including building our homes. Similar to people, you can tell each tree species apart by its unique characteristics. Dendrology has taught us that physical attributes like habitat, form, bark, branches and twigs, leaves, fruit, and flowers are all ways to tell trees apart. Dendrologists also study the structure and scale of trees which means the position in the forest canopy or understory.

## TREE IDENTIFICATION

There are several indicators to a tree species. One way is to look at the tree form; examining the size, shape and branching patterns of the tree. It may also be relevant to observe the location of the tree in relation to the surrounding trees (upper, middle or lower canopy). Shade tolerant trees are found in the lower parts of the canopy. It's important to understand species specific adaptations and requirements like amounts of sunlight, water, soil nutrients and space. Each species is adapted to environmental conditions of their habitat.

The most common method used for tree identification is to examine the leaves. One can look to see if the leaf is simple or compound. This is done by looking for the bud of the leaf to determine if it is a leaflet or a leaf. Characteristics such as leaf shape, arrangement, texture and color vary from species to species.

Another identification technique is to examine the bark. Bark can vary greatly species to species. This method is important during the winter months when there are no longer leaves that can be used for ID. Twigs can have specific arrangements on trees (alternate, opposite, whorled).

Like bark and twigs, buds can be helpful during the cold season. Buds can be terminal or lateral. Terminal buds are found at the end of each shoot. Lateral buds are found along the twig. Scale coverings and shape can vary between species. Buds can be scaled or naked.

Flowers and fruits are seasonal, but are handy with tree ID when available. Observation of flower and fruit size, shape, color, and arrangement is helpful.

## INDIANA SPECIES

There are more than 100 native tree species found in Indiana. With that much diversity, resources like field guides and online databases are important when identifying trees. There are over 75 species of trees within Mesker Park Zoo & Botanic Garden grounds and hundreds of individuals. Some trees that you may see while walking through the zoo today *may* include the species at the end of this packet but will also include **many more!**

### TULIP POPLAR

Growing to be one of the tallest and finest trees in eastern United States, the tulip is our Indiana state tree. Although sometimes called the “Yellow Poplar,” this tree is actually in the Magnolia family. The name “Tulip Tree” comes from the showy blossoms’ resemblance to tulips. The tall straight trunk of this tree made it popular among pioneers for log cabin building. Today, the easily worked wood is used for furniture, toys, musical instruments and many other articles.

### SASSAFRAS

Four different shapes of leaves can be found on most sassafras trees. Sassafras tea is brewed from the tree roots. An oil distilled from the bark is used to flavor candies, medicine and to perfume soap. When scratched, the young twigs have a pleasant spicy odor.

### PAWPAW

Although tasty and edible, the pawpaw’s ripened fruits are often difficult to find, since they are eaten by many forest animals. This small tree forms colonies or “paw paw patches” by sprouting new trees from the roots of older trees. When crushed, the large leaves have a strong odor.

### SYCAMORE

These trees are found abundantly around lakes and along many streams. The molted bark is light brown, pale green and white on top. The leaves vary in size, but are always quite broad with curving tips. Round balls hanging on long stems throughout the winter are the fruit of this tree.

### AMERICAN BEECH

The smooth, silver-gray bark of the beech makes it an especially easy tree to identify. Sometimes this bark wrinkles and looks similar to elephant skin. Unfortunately, this unique bark is often covered with carved initials. The carvings provide a site for fungus and damaging insects to enter the tree’s trunk. The leaves are thin and papery in texture.

### SUGAR MAPLE

The results of boiling the sugar maple’s sap is maple syrup and sugar. Colonists learned this use from Native Americans. Each tree yields between 5 to 60 gallons of sap per year, and it takes between 30 to 40 gallons of sap to make just one gallon of syrup. Sugar maple wood is often used in furniture.

### WHITE OAK

White oak acorns are an important source of food for many woodland animals, and were once ground into flour and used by Native Americans. The white oak’s wood is an important source of lumber for tight barrels, furniture and hardwood flooring. The leaves of the oak have rounded lobes.

Mesker Park Zoo & Botanic Garden  
STEAM

Dendrology 101 Activity

Some things you may want to bring from home: Pencil, something to write on, measuring tape or pre measured string (3 ft.).

In this activity, you will become a Dendrologist- a scientist studying trees! Your job is very important since trees are essential to life on Earth. As a dendrologist, you will be responsible for identifying tree species and their identifying characteristics as well as taking scientific measurements to add to the Mesker Park & Botanic Garden tree species database. ID as many trees as you want and send your measurements and a detailed description/photo of the trees you ID'd to [education@meskerparkzoo.com](mailto:education@meskerparkzoo.com)

**What Tree Is That?**  
Use the key to identify the three unknown trees shown below.

1. Leaves alternate .....	2
Leaves opposite or whorled .....	7
2. Leaves simple .....	3
Leaves compound .....	6
3. Leaves fan-shaped with notch at tip .....	gingko
Leaves not fan-shaped, lacking notch at tip .....	4
4. Leaves entire .....	magnolias
Leaves lobed or toothed .....	5
5. Leaves lobed .....	oaks
Leaves toothed .....	elms
6. Leaflets small .....	honeylocust
Leaflets large .....	yellowwood
7. Leaves whorled .....	catalpa
8. Leaves opposite .....	8
9. Leaves simple .....	9
Leaves compound .....	10
10. Leaves palmately lobed .....	maples
Leaves entire .....	dogwoods
Leaves palmately compound .....	buckeyes
Leaves pinnately compound .....	ashes

**Leaf Types Used in Key**

fan-shaped	entire	lobed	toothed	small leaflet
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large leaflet    whorled    opposite    compound    palmately lobed

palmately compound    pinnately compound    simple

**Unknowns:**

**TREE ID  
ACTIVITY**

In order to properly identify a tree species it is important to examine its characteristics. All species have different habitat requirements and physical characteristics. Some things that dendrologists examine for identification include the tree's bark, branches, flowers, fruit, leaves, and location in canopy. Today, you will focus on using leaves for ID since this is the most common method.

Figure 1. Leaf dichotomous key. Start at step 1 and move to the following description to figure out what type of tree the leaf comes from.

## Mesker Park Zoo & Botanic Garden: Jr. Dendrologist Journal

Pick a tree within Mesker Park Zoo & Botanic Garden grounds to study. Try to stay as close to the path as possible and put leaves back where you found them to avoid disturbing the environment. Describe the different characteristics of the chosen tree and draw the leaf underneath the chart. The dichotomous chart on the previous page can help you go through the different characteristics of leaves to determine the species. This activity can be repeated on as many trees as you would like.

Leaves	
Twigs/Branches	
Bark	
Flowers/ Fruit	

Tree Species (based off of scientific observation): \_\_\_\_\_

LEAF DRAWING/RUBBING:

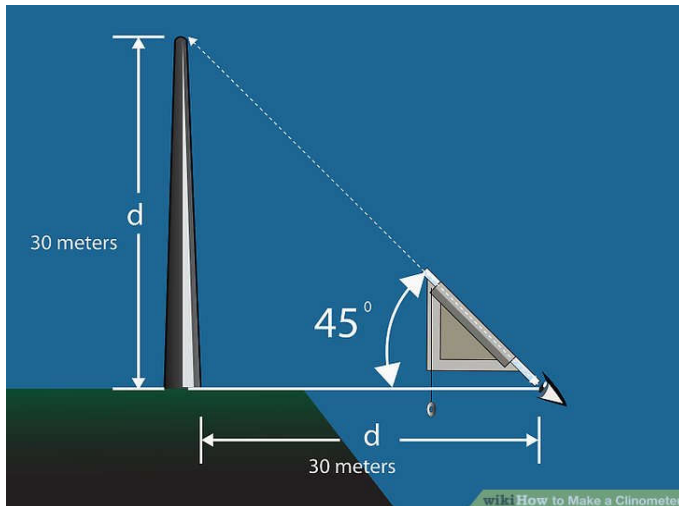
## DIAMETER AT BREAST HEIGHT (DBH)

DBH refers to the tree diameter being measured at 4.5 feet above the ground (typically chest height on an adult). This measurement can be done with a d-tape which displays the diameter measurement when wrapped around the circumference of a tree. DBH helps foresters determine the amount of timber a tree produces. Simply wrap the d-tape around the tree trunk at approximately 4.5 ft. off the ground and record the number that lines up with the 0 marking. It's important to make sure the d-tape is straight to ensure a precise measurement.



If a tree grows on an angle or on a slope, measure the smallest circumference below the lowest branch. If a tree has a branch or bump at 4.5 ft. then it is better to measure slightly above or below it. For multi-stemmed trees, the size is determined by measuring the DBH on all trunks and adding them together. The trunks must be connected above ground to be considered an individual tree.

## CALCULATING TREE HEIGHT



Dendrologists will typically use a tool called a clinometer when measuring the height of a tree out in the field. Clinometers are also used to measure angles of slope, elevation, or depression of an object with respect to gravity. Today you will be using a homemade clinometer made from common household items- paper, straw, tape, string, and a paperclip.

To use the clinometer hold the longer end of the straw next to your eye and point it to the top of the tree. Most likely the clinometer will be tilted for you to see the top through the straw. In order to fix this and have the string and paperclip aligned with the edge of the clinometer move forward and backward until the string is straight. Use the tape measure from the kit to measure the distance between the tree and your position. Since you are looking at the top of the tree with a 45 degree angle you created a 45-45-90 triangle which means all the sides are the same length! The last step is to add your height at **EYE LEVEL** to the distance you measured.

Tree Species	Location in Zoo	Canopy level (Lower, Middle, Upper)	DBH (cm)	Height (ft.)